MYCOLOGIA

VOL. XIX MAY–JUNE, 1927 NO. 3

AN EMPUSA DISEASE OF DROSOPHILA

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(WITH PLATES 8–10)

Each fall for the last four years there has occurred an epidemic of *Empusa* among the wild fruit-flies at Columbia University. Their abdomens show the swollen and banded appearance characteristic of insects attacked by species of the Entomophthoraceae (FIG. 1, PLATE 9). The flies attacked are the larger black fruit-fly *Drosophila repleta* and to a much less extent the small red-eyed fruit-fly *Drosophila melanogaster*. The circumstances that the flies are attached by means of their proboscides to the substratum, that they show the presence of the fungus only as dorsal bands between the segments of the chitin, and never as a coalescing mass over the abdomen, and that the conidia which are shot off are of the "Truncata-campaniformis-Typus" of Lakon (1919) indicate that the fungus is probably the common species *Empusa Muscae*.

Cytological study of fixed and stained preparations has established without a doubt that the fungus is morphologically identical with the common house-fly fungus which attacks other species of large and small flies, but which has never as yet been described, as far as I can learn from the literature, as occurring on species of *Drosophila*. The physiological identity of the fungus, however, cannot be established with certainty until successful cross inoculations with *Empusa Muscae* from the house-fly to *Drosophila* and *vice versa* are obtained.

[1] Contributions from the Department of Botany of Columbia University, No. 351.

[MYCOLOGIA for March–April (**19**: 43–96) was issued March 1, 1927]

I have been able to fix successfully and section and stain for cytological study the diseased specimens of *Drosophila* obtained through several seasons. I am presenting and describing the stages of conidiophore formation not heretofore presented in complete detail in sectioned and stained material. Cohn (1855) has described from living material the stages of conidiophore formation. He observed the streaming of the protoplasm upward toward the top of the conidiophore, upon which a cylindrical papilla-like projection soon arose. This projection showed a gradual widening out as it became filled with the inflowing and streaming cytoplasm. The vesicle was finally cut off from the conidiophore by a cross-wall and formed itself into a bell-shaped spore. Vacuoles arose in the massed material left below the cross-wall. Thaxter (1888) describes the formation of the conidium as a bud arising upon the conidiophore which he regards as a basidium. Thaxter claims that the conidium itself is formed within this bud, so that it is surrounded by the conidiophore-membrane as well as by its own membrane. The conidium is thus really of the nature of a single-spored sporangium. Olive (1906*b*) does not agree with Thaxter, and states that he found no evidence for regarding the spore as a sporangium containing a single spore.

I have found again in these flies the resting-spores of this fungus. The resting-spores as seen in fresh and fixed and stained material correspond in every detail with those I have already described in connection with the studies of this fungus on house-flies (1923).

The material was fixed with Flemming's weak solution, imbedded in paraffin, and the sections cut five microns thick, and stained with the Flemming's triple stain. Care was taken before fixation to remove the head, thorax, wings, and leg parts in order to make the sectioning easier.

When the white bands of conidiophores are visible on the dorsal surface of the fly's body (FIG. 1, PLATE 9), very little trace remains in the interior of the abdomen of any of the internal organs of the fly (FIGS. 2 AND 3, PLATE 9). The intestines and glandular tissues are nearly or entirely gone and only the hyphal bodies, filament fragments, and conidiophores are found. I have not

been able to decide whether the original growth of the fungus here is filamentous or by hyphal body formation. In crushed living material I have found that the hyphal body condition seems to prevail and that where these are rather elongated and branched, and interwoven together, the mass might easily be taken for a mycelial growth. The possibility however remains that a mycelium may first be formed which readily fragments and the individual portions rounding up appear as the hyphal bodies.

In sectioned and stained material, the conidiophores or hyphal tubes arise from the hyphal bodies and are oriented towards the nearest intersegmental membrane through which they can emerge to the exterior. The conidiophores are of an even width, and contain many nuclei (FIG. 4, PLATE 9). In cross-section they appear quite rounded and usually show only a single nucleus in a single section. The conidiophores must exert considerable pressure against the membrane which connects the chitinous segments of the dorsal wall of the abdomen, since in sections of flies in which the conidiophores have not broken through to the exterior, the intersegmental membranes upon which they are pressing bulge outward in a series of convolutions. When the conidiophores have broken through the intersegmental membranes, they appear in section as a cluster of club-shaped projections (FIGS. 2 AND 4, PLATE 9). The broken intersegmental membrane appears as a dark thin line folded back against the thicker chitinous segments on each side. As the hyphae emerge through the spaces between the segments, they become swollen and much larger in cross-section than the basal portions of the conidiophores within the fly's body which are now almost devoid of protoplasm (FIG. 4, PLATE 9).

My sections show that the growth of the conidiophore is not mere apical growth, but actually a migration of the entire protoplasmic content of the conidiophore up the tube so that the membrane is continually being extended upward. As the protoplasm fills this upper region of the tube, the portion of the tube just below and at the point of emergence from the fly's body becomes entirely devoid of protoplasm and appears collapsed. Only the new conidiophores pushing through at these regions are still filled with protoplasm (FIG. 4, PLATE 9).

Although the extreme tip of the conidiophore is filled with cytoplasm, it contains no nuclei (FIGS. 1 AND 2, PLATE 8). The formation of the conidium here is very much like that of *Empusa Sciarae* described by Olive (1906*a*). He describes the process for that form as follows: "a small protuberance which has a diameter equal to about half that of the conidiophore is pushed out from the end" of the conidiophore. "There is now formed at the apex of this narrow sterigma a swelling which after continued enlargement finally receives the greater part of the protoplasm and all of the nuclear content from the basal portion."

In plate 8, figures 1 and 2, the plasma-membrane has formed a narrow sterigma or elongated region. The growth of this projection is no doubt brought about, as Cohn (1855) described, by the migration upward and into the sterigma of the cytoplasmic and nuclear content of the conidiophore, causing the sterigma to bulge, and thus the conidium is formed. The connecting region or neck, that is the region from which the plasma-membrane started its outward growth to form the conidium, remains practically the same, becoming neither noticeably narrower nor perceptibly wider. Figures 2, 3, and 4 of plate 8 show various stages in the progressive movement outward of the cytoplasmic threads and nuclei. The arrangement of the cytoplasm seems to indicate a gradual drawing away of the moving threads of cytoplasm from the lower conidiophore walls upward toward the tip. When the entire cytoplasmic material has entered the conidium, the swollen tip of the conidiophore now contains only a slight granular matter (FIG. 6, PLATE 8). This is probably of the nature of a waste colloidal material which originally lay in the tube outside of the streaming threads of cytoplasm.

I have not as yet been successful in obtaining preparations which show the formation of this wall or membrane which cuts off the conidium from the conidiophore itself. Olive (1906*b*) describes the formation of walls in the Entomophthoraceae by means of a cleavage furrow in conidiophores, in vegetative hyphae and in the cutting off of the conidia from the conidiophores. He describes and figures the process as consisting in the formation of a ring-shaped partition which grows inward from the hyphal wall across the vacuolar space of the hypha cutting off one portion of

the hypha from the other. The plasma-membrane first folds inwards, and the young wall is deposited between the two layers as the fold extends inward. The nuclei are described as appearing in a state of rest and therefore not connected closely with the process. Olive states that this may indicate that cell-division here is a cytoplasmic phenomenon. In the case of the abstriction of the conidium from the conidiophore the cleavage furrow formed by the folding inward of the plasma-membrane cuts through the dense cytoplasm which fills the neck connecting the conidiophore with the conidium.

My sections show no indication of a double wall being present around the protoplasm of the spore such as Thaxter describes. The conidium is surrounded by the original cytoplasmic membrane of the conidiophore and is not at all of the nature of a sporangium. In figure 7, plate 8, the fixation has caught the conidiophore in the act of swelling to the point of bursting and the conidium is already somewhat forced out of its position upon the conidiophore tip. The plasma-membrane of the conidiophore is still connected to the conidium though reduced to extreme thinness and is apparently ready to give way.

As shown in figures 6 and 7, plate 8, the mature conidium in all respects resembles that of *Empusa Muscae* upon the common house-fly. In the formation of the secondary conidia, which I have been able to observe in *Empusa Muscae* conidia obtained from *Musca domestica* and *Drosophila repleta*, the process consists of a budding outward from the primary conidium, and the ultimate abstriction of the secondary spore. As Cohn (1855), Thaxter (1888), and Güssow (1917) have already figured such stages, it is not necessary to repeat them. The primary conidial spore when shot off often is enveloped in a layer of gelatinous material, the discharged contents of the conidiophore when it burst and threw off the spore. The conidium, falling upon a suitable medium for germination but not for the penetration of the hypha, will often send out a tiny rounded papilla or projection from the lower side of the conidium. Into this all the contents of the conidium flow enlarging it into a rounded bell-shaped spore which does not show the characteristic papillate tip of the primary conidia of *Empusa Muscae* and which is smaller in size.

Güssow (1917) has erroneously referred to the oil drop in the primary and secondary conidia which can be seen with the low power of the microscope as the nucleus of the spores. As has been shown by Cavara (1899), Olive (1906*a*), and myself (1923), the conidia of *Empusa Muscae* are multinucleate. In living material the nuclei are invisible. The conidia, hyphal bodies, and conidiophores are rich in oil drops which in the fixed material may be dissolved out completely and leave no trace or remain as rounded areas in the cytoplasm marking the former position of such oil drops. There is no indication in the living hyphae or spores of the nuclei which are seen in fixed and stained sections of the fungus. The nuclei in my photographs of the fungus from stained sections (PLATES 9 AND 10) are clearly evident as dark staining rounded bodies lying in the cytoplasm of the spores, conidiophores, and hyphae.

The resting-spores (FIGS. 8–10, PLATE 8, AND FIGS. 1 AND 3, PLATE 10) that I find in dried specimens of *Drosophila* appear to be of the chlamydospore type such as I figured and described in my previous paper (1923). They are formed by the rounding up of the intercalary or apical protoplasm and occur usually near the external walls of the fly. The thick wall is laid down within the hyphal membrane as is evident in figure 8, plate 8. In figures 8 and 10, plate 8, it is clearly evident that the resting-spores in both these cases have been formed on a conidiophore tube unable to reach the exterior. The thick wall is smooth and unmarked as in the case of the resting-spores of *Empusa Muscae* found in the house-flies. Within the thick wall is a thin plasma-membrane as is evident in the case shown in figure 10, plate 8, where slight shrinkage has occurred.

Contrary to Winter's (1881) report of the finding of resting-spores of *Empusa Muscae* in damp situations out of doors, the resting-spores found in *Drosophila* (as in the case of those I found in dried house-flies) were found when the hyphae in the flies' bodies appeared dried and shriveled. Figure 1, plate 10, shows the dried, shriveled appearance of the conidiophores while within the fly's body the resting-spores are forming. Martin (1924) found the resting-spores of *Empusa Muscae* in a house-fly from which conidia were still being discharged. This is contrary to

my own observation of their occurrence in drying specimens of house-flies and *Drosophila* in which conidial discharge was no longer possible.

As far as I can tell from sectioned material the resting-spores are typical chlamydospores since they appear to be simply rounded portions of the hyphal filaments themselves. The spores seem to be able to germinate quite readily. Figure 10, plate 8, shows a small germ-tube emerging from the resting-spore. Flies showing resting-spores when placed for even a short time in a moist-chamber will show the emptied spore-walls and the long conidiophores growing outward toward the intersegment spaces for the discharge and the formation of the conidia. Figure 3, plate 10, shows a photograph of a portion of a stained section of a *Drosophila* fly which was placed for about half an hour in a moist-chamber before fixation, and as is evident many of the resting-spores present show germ-tubes emerging from the spores.

Throughout the literature of the Entomophthoraceae there seems to be considerable discussion as to what are the distinctive differences between the two genera *Empusa* and *Entomophthora*, and as to whether these two names should be retained, or one or the other should be discarded. Cohn (1855) who was the first to investigate the fungus attacking house-flies named the fungus *Empusa*. Winter (1881) called the house-fly fungus *Entomophthora*. Thaxter (1888) would use the term *Empusa* for all the entomophthorous forms. His reason for this is that the only distinct difference between *Empusa* and *Entomophthora* rests in the digitate conidiophores found in such species of *Entomophthora* as *E. americana* for example. Cavara (1899) was the first to suggest the recognition of nuclear characters of the conidia for distinguishing the genera *Empusa* and *Entomophthora*. Olive (1906*a*) however does not think this justifiable and uses the term *Empusa* for all of the forms. In my opinion the nuclear number in the conidia and the branching of the conidiophores together are sufficient grounds for distinguishing between these two genera. This basis for classification was first suggested by Nowakowski (1884) and is also advocated by Lakon (1919).

The genus *Empusa*, as represented by the species *Empusa Muscae* which I have studied in house-flies and fruit-fly species,

shows the conidiophores emerging only between the segments of the fly's body on the dorsal surface, and not in a coalescing mass over the insect's body. This is very evident in my photographs of sectioned *Drosophila* flies (FIGS. 2, 3, AND 4, PLATE 9, AND FIG. 1, PLATE 10). The insects attacked by *Empusa* are found attached to the substratum usually by their proboscides. The conidiophores of this genus are unbranched, and appear as simple multinucleate tubes emerging from the fly's body. Such conidiophores are shown in figure 4, plate 9. The conidia are multinucleate as shown in figures 6 and 7, plate 8. I have found resting-spores to be formed as part of the life-cycle of the fly-fungus and this has been confirmed by Martin (1924). Thus the characteristic of no resting-spores given by Lakon (1919) for this genus can no longer stand. The resting-spores of *Empusa Muscae* are shown in figures 8, 9, and 10, plate 8, and in figures 1 and 3, plate 10, for the fungus in *Drosophila* flies, and in figure 4, plate 10, for the fungus in house-flies.

The genus *Entomophthora* of which I have studied two species, *E. americana* and *E. americana* X (Riddle) occurring on species of large flies, shows the conidiophores as a coalescing mass over the body of the insect. This coalescing mass of conidiophores is evident in figure 2, plate 10, outside of the dark broken line which represents the section through the chitinous wall of the insect. The conidiophores in this form are branched and each gives rise to a single conidium containing a single nucleus (uninucleate). Cystidia or sterile hyphae, and rhizoids which attach the dead insect to the substratum are usually present in these forms. The resting-spores of *E. americana* X (Riddle) are shown in figures 2 and 5, plate 10. It seems to me that these characters when compared with those of *Empusa* are sufficient grounds for separating the two genera.

I am presenting below the species of *Entomophthora* upon which cytological study has been done, and also presenting the descriptions of morphological characters of these fungi as found in Thaxter's (1888) and Lakon's (1919) monographs of these forms. I am naming the fungi *Entomophthora* if the authors who studied them cytologically found their conidia uninucleate. If they are described as having multinucleate conidia, I am using the generic

name *Empusa*. In the case of the form that attacks the mosquitoes and gnats, I am using the name *Lamia* as first suggested by Nowakowski (1884). Its conidia are uninucleate or binucleate according to Olive (1906*a*). Brefeld (1870), Nowakowski (1884), and Lakon (1919) have all advocated separating the form *Empusa Culicis* as a new genus *Lamia*. These authors regard this species as an intermediate genus between the other two genera *Empusa* and *Entomophthora*.

Fungus	Author	Conidiophore Structure. Presence of Cystidia and Rhizoids (Thaxter and Lakon)
Entomophthora Sciarae	Olive (1906)	Branched conidiophores Cystidia and rhyzoids present
Entomophthora delpiniana	Cavara (1899)	Conidiophores branched Cystidia present
Entomophthora gloeospora	Vuillemin (1887)	Conidiophores branched Rhizoids present
Entomophthora americana	Riddle (1906)	Branched conidiophores Rhizoids present
Entomophthora X	Riddle (1906)	Branched conidiophores
Entomophthora geometralis	Riddle (1906)	Branched conidiophores Rhizoids present
Entomophthora echinospora	Riddle (1906)	Branched conidiophores Rhizoids present
Entomophthora rhizospora	Riddle (1906)	Branched conidiophores Cystidia and rhizoids present
Entomophthora Fresenii	Riddle (1906)	Simple conidiophores Cystidia and rhizoids not present
Entomophthora Aphidis	Olive (1906)	Branched or simple conidiophores Cystidia and rhizoids present
Empusa Muscae	Cavara (1899)	Unbranched conidiophores Cystidia and rhizoids not present
Empusa Grylli	Riddle (1906)	Simple conidiophores Cystidia and rhizoids not present
Lamia Culicis	Olive (1906)	Simple or branched conidiophores Cystidia present (Nowakowski) Cystidia not present (Thaxter) Rhizoids present (Lakon) (Brefeld) Rhizoids not present (Nowakowski)

Now studying the table we note that the only irregularity is in the case of *E. Fresenii*. Riddle (1906) designates this as a form with uninucleate conidia, and Thaxter's (1888) description of it as a fungus with simple conidiophores, and lacking rhizoids and cystidia, would make this seem to upset the classification. However Thaxter (1899) himself states that the position of this form

among species of *Empusa* is only provisional, in that its conidia are smoky tinted and thick-walled, and that they produce peculiar almond-shaped secondary conidia on capillary conidiophores, and the zygospores arise as buds upward from the point of conjugation of gametes arising from two hyphal bodies. For this form and its related form *E. lageniformis*, if the latter should sometime be shown to possess uninucleate conidia also, the genus *Triplosporium* as Thaxter suggests might be advocated.

I am presenting a classification of the parasitic Entomophthoraceae attacking insects. The outline follows that of Nowakowski (1883) and Lakon (1919) considerably. I have added the nuclear condition of the conidia to each group as far as it is known, this being a very decisive factor I believe in the separation of the first three genera. The sequence of the genera is not intended to indicate the evolutionary development of these forms.

ENTOMOPHTHORACEAE—PARASITIC GENERA ATTACKING INSECTS

Empusa:
- Conidia multinucleate.
- Conidiophores simple.
- Cystidia and rhizoids not present.

Lamia—an intermediate genus (Nowakowski (1884)):
- Conidia uninucleate, binucleate, rarely trinucleate.
- Conidiophores simple (Nowakowski) (Olive) (Lakon).
- Conidiophores branched (Brefeld).
- Cystidia present (Nowakowski), not present (Thaxter).
- Rhizoids present (Brefeld) (Lakon), not present (Nowakowski).

Entomophthora:
- Conidia uninucleate.
- Conidiophores digitate.
- Cystidia and rhizoids generally present.

Tarichium—a provisional genus until the conidia are found for its species:
- Resting-spores only are known.

Triplosporium (Thaxter):
- Conidia uninucleate? smoky tinted.
- Conidiophores unbranched.
- Rhizoids and cystidia lacking.
- Zygospores arise as a bud from the point of conjugation between two hyphal bodies.

Massospora:
- Conidia (nuclear condition not known).
- Conidiophores (branching condition not known).
- Conidia formed within host's body and adhering in masses.

SUMMARY

The two fruit-flies *Drosophila repleta* and *melanogaster* are attacked by an Entomophthorous fungus identical in all structural characters with *Empusa Muscae* which attacks the common house-fly *Musca domestica*. Conidium formation, as observed from stained and sectioned material of the *Drosophila* flies dead with the disease, is by means of the moving upward of protoplasmic threads and the many nuclei into a sterigma arising as a bud on the top of the conidiophore tube. When the entire content of the conidiophore has flowed into the sterigma causing it to swell up to form a bell-shaped spore, the conidium is cut off from the emptied conidiophore tube by a cross-wall. Resting spores similar to those found in dried house-flies were also found in connection with the fungus attacking the *Drosophila* species.

I hereby acknowledge my indebtedness to Dr. R. A. Harper for his many valuable suggestions in this study and the preparation of this paper.

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EXPLANATION OF PLATE 8

The drawings were made with the aid of the Abbe camera lucida. A Zeiss microscope was used with a 1/12 in. oil immersion objective and a number 3 ocular. The magnification is about 1200 diameters.

Fig. 1. A conidiophore lying outside of the fly's body. The cytoplasm is somewhat fibrillar in appearance and scattered through it are numerous nuclei.

Fig. 2. The content of the conidiophore has moved along the tube toward the free extremity of the conidiophore, leaving the basal portion of the tube nearer the fly's body devoid of protoplasm. A small sterigma has formed at the free top of the conidiophore.

Fig. 3. The protoplasm of the conidiophore has moved farther down the tube, while the basal portion is beginning to collapse. The young conidium already contains three nuclei.

Fig. 4. The young conidium is growing larger as more of the cytoplasm and the nuclei enter it.

Fig. 5. Nearly all of the nuclei have now entered the conidium, and very little cytoplasm is left in the conidiophore. The young conidium shows the small papilla which is characteristic of the primary conidia of this species.

Fig. 6. The conidium is completely formed, and cut off from the conidiophore by a septum.

Fig. 7. The mature conidium is breaking away from the conidiophore, whose membrane, still unbroken, appears in the section to be very thin and drawn out.

Fig. 8. A chlamydospore containing eight nuclei, and rounded clear areas marking the position of the oil drops present in living material.

Fig. 9. A rounded resting spore containing seven nuclei.

Fig. 10. A rounded chlamydospore with a portion of the emptied tube from which it arose still attached. A small germ tube is present into which one nucleus has already moved out. The thin membrane of the hyphal tube is clearly visible as it surrounds the thicker wall of the resting-spore itself.

EMERGENCE OF CONIDIOPHORES FOR DISCHARGE OF CONIDIA

RESTING-SPORES

EXPLANATION OF PLATE 9

Fig. 1. A photograph of a specimen of *Drosophila repleta* dead with the *Empusa* disease. The abdomen shows the bands of fungus conidiophores as they appear projecting between the dorsal segments of black chitin.

Fig. 2. A photograph of a section 5 μ thick of a fly that has been fixed with Flemming's weak solution, embedded in paraffin, and sectioned and stained with the Flemming's triple stain. The conidiophores are seen emerging from the body, between the segments.

Fig. 3. A similar section through the abdomen showing the conidiophores emerging from the fly's body through the broken intersegmental membranes between the bands of chitin on the dorsal surface of the fly's body.

Fig. 4. A group of conidiophores seen in section as they emerge through the broken intersegmental membrane between the two dorsal segments of chitin. Several stages in conidium formation are shown, as well as the presence of great numbers of nuclei in the cytoplasm of the conidiophores, and the unbranched condition of the conidiophores.

EXPLANATION OF PLATE 10

Fig. 1. A photograph of the section of a fly's abdomen showing the conidiophores dried and shriveled. Resting-spores are forming within the insect's body.

Fig. 2. Resting-spores of *Entomophthora americana* X (Riddle) lying within the body. The chitinous body wall broken in sectioning is here shown as a series of broken heavy lines. The conidiophores which form a coalescing mass over the abdomen of the fly are also shown. The conidiophores are the ultimate branches of those which left the fly's body. Each now contains a single large nucleus, and will form a conidium at its tip containing all the cytoplasm of the tube and the single nucleus.

Fig. 3. Germinating resting-spores of *Empusa Muscae* within a *Drosophila* fly after lying within a moist-chamber for half an hour.

Fig. 4. Resting-spores of *Empusa Muscae* found within the body of a dried house-fly. The walls of the spores are smooth, but appear irregular due to the remains of the collapsed hyphal membranes about them.

Fig. 5. Resting-spore of *Entomophthora* X (Riddle) showing the presence of bullate thickenings on its wall. The spores of this fungus were found within the abdomen of a dried flower-fly (*Calliphora erythryocepha*) attached to the flowers of *Rubus laciniatus*.

NOTES ON THE PARASITIC FUNGI OF ILLINOIS—III

L. R. Tehon and E. Y. Daniels

(With Plate 11)

The material from which this paper is drawn consists of the incidental collections of the Illinois State Natural History Survey's botanists. Submitted as a contribution toward cataloging the fungous flora of the world, as well as of Illinois, it contains an account of five Ascomycetes and twenty-nine imperfect fungi.

In the treatment of the Fungi Imperfecti, it is now—as it has been—customary to regard them as separable species when they inhabit distinctive hosts or when they manifest tangible differences in morphology; and the custom is not without its advantages, despite the adverse criticism which has been heaped upon it, for it emphasizes in the matter of "fundamental," or "genetic," species an intimate interdependence of fungus and host that has been demonstrated more often than disproved. Moreover, though we may envision an ultimate phylogenetic taxonomy, we are still too poorly advanced in research to invent a more practical device for perpetuating a knowledge of the imperfect forms. If the time comes when we are able to list the thallic connections of the Ascomycetes with all their spore forms, there will be needed still, for purposes of description, differentiation, and recognition, a classification of the imperfect ones, which, though possibly simpler, must yet take cognizance chiefly of their morphism, their coloration, and their limits of parasitism.

The specimens, which are in the Survey's Mycological Collection, are designated especially by accession numbers; and when, upon request, portions of them are sent elsewhere, the labels will bear those numbers.

Phyllachora Cinnae Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, extensive, longitudinal, straw-colored stripes which become confluent laterally and at the ends,

and so involve all the leaf tissue. Stromata abundant, lying in longitudinal rows between the veins, elongate-elliptic in outline, 0.1–0.2 × 0.5–2 mm., the largest containing about 16 ascigerous locules arranged in two parallel rows of 8 each, the locules united above by an epiclypeus which lies in the epidermal layer, but generally separate below except in a small central part where the stroma is loosely developed into an indefinite hypoclypeus. Locules spherical, paraphysate, 75–125 μ in diameter. Asci long-cylindric, short-stipitate, 6–12 × 60–70 μ. Paraphyses filiform, slightly exceeding the asci. Spores hyaline, continuous, uniseriate, often lying nearly horizontally in the ascus, short-oblong to very broadly oval, 3.5–4 × 6–9 μ. PLATE 11, FIG. 1.

On *Cinna arundinacea*.

Granite City, Madison County, August, 1920. Acc. No. *9316* (type).

Nitschkia Polygoni Tehon & Daniels, n. sp.

Caulicolous; inhabiting the cortical cells through several internodes. Cells of the epidermis, cortex, phloem, and cambium parasitized and occupied by the abundant mycelium, but not disorganized. Perithecia very abundant, spherical to applanate, 150–300 μ in diameter, cespitose, 4 to 12 or more in a group, and frequently united by a dense, brown subiculum covering their lower third; the groups irregularly distributed and crowded. Ostiole rostrate, up to 45 μ high and 15–30 μ broad, protruding through the cuticle. Asci saccate to broadly obclavate, short-stipitate, 35–60 μ long by 15–22 μ wide, 8-spored. Paraphyses filiform, exceeding the asci. Spores continuous, hyaline, ellipsoid, often with one end nearly acute, 6–8 × 12–16 μ. PLATE 11, FIG. 2.

On *Polygonum* sp.

Villa Ridge, Pulaski County, June 21, 1925. Acc. No. *9239* (type).

Stigmatea Plantaginis Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, at first small and brown, later white throughout and friable, eventually crumbling away, irregular, 0.25–5 mm. wide; margin dark brown, very narrow, raised. Perithecia developed beneath the cuticle, membranous but very dark, spherical, opening epiphyllously, paraphysate, 130–160 μ in diameter. Ostiole present, variable, 8–14 μ wide, practically non-functional, the perithecia eventually becoming erumpent and widely fissured. Asci oblong-cylindric, apically

obtuse and thickened, 50–70 × 8–10 μ, rather short-stipitate, opening by a pore. Spores hyaline, spindle-shaped, equally or nearly equally 1-septate, biseriate, 10–17 × 3–3.6 μ. Paraphyses filiform, hyaline, exceeding the asci.

On *Plantago virginica*.

Carthage, Hancock County, July 24, 1922. Acc. No. *7652* (type).

Rostrosphaeria Tehon & Daniels, n. gen.

Perithecia glabrous, subcarbonous to carbonous, spherical to applanate, innate in the host tissue, not erumpent, with a long, straight, rostrate ostiole. Asci thickened apically, with an apical pore, 8-spored. Spores hyaline, 1-celled. Paraphyses simple, septate.

This genus belongs in the Gnomoniaceae and is closely similar to both *Gnomoniella* and *Camptosphaeria*, being distinguished from the former by the presence of paraphyses and from the latter by its straight, ostiolar rostrum. It is based on the following species.

Rostrosphaeria Phlei Tehon & Daniels, n. sp.

Foliicolous; inhabiting the dead leaves of the previous year. Spots absent. Perithecia very abundant, without a stroma, lying in rows between the veins, developing in and occupying the mesophyll, erumpent amphiphyllously by means of a long, rostrate ostiole, spherical to applanate, 170–350 μ wide, membranous, becoming carbonous with age, paraphysate. Ostiole erumpent through the epidermis, 105–210 μ long, 60–150 μ wide at the base, tapering somewhat. Asci abundant, clavate, long-stipitate, bluntly rounded and thickened at the apex, with a pore through which the spores escape, 60–80 × 14–17 μ. Paraphyses very numerous, coarsely filiform, unbranched, several septate, not exceeding the asci, 2 × 50–75 μ. Spores hyaline, continuous, fusiform, granular, arranged in 2 spiral rows, 12–18 × 4–5 μ. PLATE 11, FIG. 3.

On *Phleum pratense*.

Jacksonville, Morgan County, July 25, 1925. Acc. No. *893* (type).

Exilispora Tehon & Daniels, n. gen.

Sphaeriaceous. Perithecia glabrous, membranous, coriaceous, or carbonous, spherical to applanate, paraphysate. Ostiole rostrate. Spores dark, scoleciform.

This genus, based on the following species, is very close to *Ophiobolus* in its morphology; but it is quite distinct, for among the heterogeneous *Ophioboli* now known no species serves as an intermediate or connecting form. In the Saccardian system, it becomes the only genus falling definitely in the Phaeoscoleciae of the Sphaeriaceae. It is separated from *Rhyncosphaeria*, of the Phaeophragmiae, only by its definitely scoleciform spores.

Exilispora plurisepta Tehon & Daniels, n. sp.

Caulicolous, not maculicolous or on cankers, on much of the length of the stem. Perithecia in linear rows between the strands of sclerenchymatous fiber, numerous, often contiguous and appearing joined, lying beneath the epidermis, through which their ostioles protrude, or exposed by its exfoliation, spherical to applanate, membranous to carbonous, 200–350 μ in diameter, with a short, conically tapered, ostiolar rostrum; seated upon a loose, indefinite subiculum. Asci cylindric to clavate, very long-stipitate, 75–110 $\times$ 10–15 μ, 8-spored. Ascospores scoleciform, 10–20-septate, ends tapering, olivaceous to brown, 65–80 $\times$ 3–4 μ, lying in a single bundle within the ascus. Paraphyses filiform, abundant, much exceeding the asci, hyaline. PLATE 11, FIG. 4.

On *Erigeron* sp.

McNabb, Putnam County, June 28, 1922. Acc. No. *8404* (type).

Phyllosticta Porteri Tehon & Daniels, n. sp.

Spots irregularly circular, apparent on both sides of the leaf, 2–10 mm. in diameter or, by confluence, becoming very much larger, often marginal though not usually so; upper surface dark tan to brown with faintly marked concentric rings, emarginate except for a water-soaked band 0.5 mm. wide which, in the dry specimen, appears dark grey with a reddish tinge; lower surface tan to cinereous, concolorous, the water-soaked margin faintly visible and the bordering veinlets red-tinted. Pycnidia non-carbonous, 90–150 μ in diameter, lying in the mesophyll, erumpent, protruding slightly below, causing noticeable distensions of the upper surface, one or two developing in each areola but lying near the veinlets, not restricted to the center of the spot but usually centered there. Ostiole round, 7.5 μ wide in smaller pycnidia, 22 μ wide in the largest ones. Spores hyaline, eguttulate, allantoid, 2 $\times$ 4 μ.

On *Syringa vulgaris*.

Oregon, Ogle County, August 26, 1922. Collected by Dr. C. L. Porter. Acc. No. *3097* (type).

Four species of *Phyllosticta* have been reported on this host; but this one is distinct enough to deserve separate recognition. They may be separated as follows:

Spores 10 to 20 μ long.
  Spores 5 to 7 μ wide ..... *P. Halstedii.*
  Spores 2 μ wide ..... *P. syringicola.*
Spores 5 to 10 μ long ..... *P. Syringae.*
Spores 5 μ long or less
  Spores globose, pycnidia carbonous ..... *P. syringophila.*
  Spores allantoid, pycnidia non-carbonous ..... *P. Porteri.*

Phyllosticta Gymnocladi Tehon & Daniels, n. sp.

Spots circular, 0.5–3 mm. in diameter, diaphyllous, the centers crumbling away with age, light tan to cinereous above with a very narrow but marked dark-purple margin, tan below with a diffused purple margin. Pycnidia epiphyllous, crowded, ostiolate, globose to strongly applanate-globose, membranous when young but carbonous when old, lying in the palisade tissue, often thickened above so as to appear slightly rostrate, not or only very inconspicuously clypeate, 70–135 μ in diameter. Ostiole piercing the epidermis, protruding slightly, 15–22 μ wide. Locule corresponding to the pycnidium in size and shape, at first filled with a hyaline pseudoparenchyma, later with spores embedded in a gelatinous matrix. Conidiophores absent. Spores hyaline, continuous, globose, broadly elliptical or ovate, not guttulate, 4.5–9 $\times$ 4–6.5 μ, arising simultaneously with the histolysis of the locular pseudoparenchyma. PLATE 11, FIG. 5.

On *Gymnocladus dioica.*

Lawrenceville, Lawrence County, August 27, 1925. Acc. No. *10319* (type).

We place this species in *Phyllosticta*, though understanding clearly that its morphological characters should place it in *Phyllostictina*. For the latter genus there are now three conflicting concepts: First, the original one of Sydow,[1] based upon the morphology of the specimen which became the monotype of the genus, of a pycnidium filled with a pseudoparenchyma whose histolysis gives rise to the spores; second, that of von Höhnel,[2]

[1] Sydow, H. & P., & E. J. Butler. Fungi Indiae orientalis. Ann. Myc. **14**: 185–186. 1916.

[2] Höhnel, F. von. Ueber Phyllostictina Murrayae Sydow. Ann. Myc. **18**: 93–95. 1920.

also probably based upon the monotype, of a pycnidium filled with a pseudoparenchyma subject to histolysis but with spores borne upon simple, mostly short, and evanescent conidiophores; third, that of Shear,[3] based in part upon von Höhnel's concept, of a pycnidium morphologically the same as von Höhnel's but "restricted in its application to the pycnidial forms of the genus *Guignardia*, as applied to species congeneric with the common *G. Bidwellii*." *Phyllostictina* now contains the following species: *P. Murrayae* Syd. (the type), *P. uvicola* (Berk. & Curt.) v. Höhnel, *P. carpogena* Shear, and *P. Vaccinii* Shear. According to Shear, *Phyllosticta solitaria* Ellis & Ev. and *Phyllosticta congesta* Heald & Wolf should be included also. Guba,[4] in his detailed study of *P. solitaria*, concludes that that species is not admissible to Sydow's concept but may be admissible to von Höhnel's. The same should hold true for *Phyllosticta congesta*, on the basis of Roberts'[5] statement of its similarity to *P. solitaria*. Shear's figures and description of *Phyllostictina carpogena*, as well as his slides, show that it is not congeneric with *Phyllostictina* Sydow, or with *Phyllostictina* Sydow, emend. v. Höhnel, and may not be consistent with his stated concept of that genus: First, in having functioning conidiophores; second, in having persistent conidiophores; and third, in being neither congeneric with a type nor the as yet proved conidial stage of a *Guignardia*.

Respecting the species involved, the fact seems apparent that there are two groups, characterized generally as being pycnosclerotic but distinguishable as follows:

1. Sporophores absent, spores liberated through the histolysis of a pseudoparenchyma, pycnidia functioning soon after formation and ceasing to function with the discharge of the one spore crop. Including *Phyllostictina Murrayae* Syd. and *Phyllosticta Gymnocladi* T. & D.

2. Sporophores developing subsequent to the histolysis of a pseudoparenchyma, pycnidia functioning after a period of dor-

[3] Shear, C. L. Life histories and undescribed genera and species of fungi. Mycologia **15**: 129–131. 1923.

[4] Guba, E. F. Phyllosticta leaf spot, fruit blotch, and canker of the apple: its etiology and control. Univ. of Ill. Agr. Exp. Sta. Bull. No. 256. 1925.

[5] Roberts, J. W. Plum blotch, a serious disease of the Japanese plum, caused by *Phyllosticta congesta*. Jour. Agr. Res. **22**: 365–370. 1921.

mancy and then without mechanical limitation; spores provided with a mucous appendage. Also normal *Phyllosticta* pycnidia functioning immediately after development. Including *Phyllosticta solitaria* Ellis & Ev. and probably also *P. congesta* Heald & Wolf, *Phyllostictina uvicola* (Berk. & Curt.) v. Höhnel, *P. carpogena* Shear, and *P. Vaccinii* Shear.

Group 1 is equivalent to *Phyllostictina* Sydow, the second species being, by comparison, wholly congeneric with the monotype. Group 2 requires further analysis but could be grouped in a genus based on the dormant pycnosclerotia or left in *Phyllosticta* on the basis of the non-dormant sporulation. In any event, von Höhnel's emended *Phyllostictina*, applying neither to the monotype nor to apparently related species, and being drawn quite as much from suppositions as from facts, must be ignored: it should have no taxonomic standing.

It seems, too, that no significance should attach either to proved or to supposed relations between imperfect fungi and ascomycetous genera as factors delimiting genera in the Fungi Imperfecti, for it is imperative that morphology alone furnish such distinctions.

Phyllosticta solidaginicola Tehon & Daniels, n. sp.

Spots diaphyllous, circular, 1–5 mm. in diameter, cinereous, friable, definitely limited by a narrow, raised, purple border. Pycnidia few, scattered, hypophyllous, limited to the epidermal layer, globose to applanate-globose, carbonous, ostiolate, 75–130 μ in diameter; walls thin, black; clypeus absent; ostiole erumpent, never rostrate, 12–15 μ wide. Spores continuous, hyaline to smoky, ellipsoid, 2–3 $\times$ 4–6 μ, granular. Conidiophores simple, filiform, 2–15 μ long, arising laterally and basally in the pycninidium

On *Solidago* sp.

Sumner, Richland County, August 27, 1925. Acc. No. *10114* (type).

The species of *Phyllosticta* occurring on *Solidago* may be distinguished as follows:

Occurring on insect galls..... *P. gallicola.*
Not on galls.
Spores pedicellate..... *P. sphaeropsispora.*

Spores not pedicellate.
Spores 5–6 × 10–15 μ.....*P. similispora.*
Spores 2–3 × 4–6 μ.....*P. solidaginicola.*

Phyllosticta nymphaeicola Tehon & Daniels, n. sp.

Spots oval to round, lying between the veins, 3–8 mm. wide by 5–15 mm. long, often confluent, diaphyllous, concolorous, dark brown above with a straw colored area connecting neighboring spots, lighter brown below and appearing silvery. Pycnidia strictly hypophyllous, few, scattered, immersed, membranous, spherical to slightly applanate, 110–135 μ in diameter; ostiole slightly raised, protruding through the epidermis, becoming carbonous with age, 12–15 μ wide. Conidia bacilliform, oblong, with rounded ends, hyaline to smoky, continuous, exuding in cirrhi, 2–2.5 × 2.5–5 μ.

On *Nymphaea advena*.

Olney, Richland County, August 28, 1925. Acc. No. *11093* (type).

This and the other three *Phyllostictae* occurring on this host may be distinguished as follows:

Pycnidia epiphyllous, or amphigenous; spots concentrically marked.
Pycnidia small (60–80 μ), spores 2–3 × 7–10 μ.....*P. nymphaeacea.*
Pycnidia large (up to 100 μ), spores 3–4 × 6–10 μ.....*P. fatiscens.*
Pycnidia very large (150–180 μ), spores 1.5–2 × 5–7 μ....*P. hydrophila.*
Pycnidia strictly hypophyllous, spots concolorous, spores 2–2.5 × 2.5–5 μ.....*P. nymphaeicola.*

Phyllosticta glycineum Tehon & Daniels, n. sp.

Spots diaphyllous, 1–5 mm. in diameter, subcircular, cinereous, deciduous, purple-bordered. Pycnidia amphiphyllous, globose to somewhat applanate, membranous, 90–170 μ in diameter, immersed; ostiole protruding slightly, 10–20 μ wide, becoming carbonous. Spores oblong to narrowly ellipsoid, with rounded ends, continuous, hyaline to smoky, 2–2.5 × 4.5–7 μ, exuding in cirrhi.

On *Glycine hispida* (soybean).

Arthur, Douglas County, July 6, 1925. Acc. No. *4392* (type).

This species may be identical with *P. decidua* Ellis & Kellerm. as now understood and may be only of accidental occurrence on soybean. Besides the current doubt that *P. decidua* is a homogeneous species, certain distinctions of a morphological and physiological nature may be held to justify segregation, such as

the larger spots, larger variation in pycnidial size, larger and more nearly bacilliform spores, and the fact that *P. decidua* is not yet reported on any *Leguminosae*.

Spore size would seem to indicate identity with *P. phaseolina* Sacc., but gross and microscopic comparisons of the two (we have collected the latter several times on cowpea) reveal striking dissimilarities of aspect.

Phyllosticta plantaginicola Tehon & Daniels, n. sp.

Spots diaphyllous, circular to subcircular, 0.5–5 mm. in diameter, dark brown when young, becoming cinereous, papery, depressed, and fragile with age, sometimes confluent; margins dark brown, narrow, prominently raised. Pycnidia few—2 or 3 in the usual spot, scattered, protruding epiphyllously and becoming semi-exposed through the collapsing of dead leaf tissue, carbonous, 120–180 μ in diameter, developing in and occupying the mesophyll, spherical to broadly applanate-globose; ostiole not rostrate, only very slightly raised, at first hardly protruding, 20 μ wide. Spores oblong to elliptic, rarely ovoid, appearing hyaline individually but in groups (as in cirrhi) having a decided olivaceous tint, continuous, 3–4 $\times$ 7–8 μ.

On *Plantago virginica*.

Marshall, Clark County, July 18, 1925. Acc. No. *3188* (type).

This species is very close to *Phoma paradoxa* Kab. & Bub. in habit and superficial aspect; but the spore size and shape are distinctive, those of the *Phoma* measuring 2.5–3.5 $\times$ 12–15 μ. Distinction is easily made from the two other *Phyllostictae* on species of *Plantago*:

Pycnidia 60–100 μ in diameter, spores 2–3 μ wide.
Spores elongate, allantoid, up to 9 μ long ..... *P. plantaginella.*
Spores short, oblong to ovoid, up to 5 μ long ..... *P. Plantaginis.*
Pycnidia 120–180 μ in diameter, spores 3–4 μ wide, oblong to elliptic, 7–8 μ long ..... *P. plantaginicola.*

Phyllosticta avenophila Tehon & Daniels, n. sp.

Spots diaphyllous, very extensive, one half to several cm. long, half as wide or fully as wide as the leaf, cream colored to pale yellow, unlimited, emarginate. Pycnidia numerous, on the sides of the veins, in closely clustered rows which are widely scattered over the spot, spherical to slightly applanate, somewhat rostrate, occupying the mesophyll, protruding epiphyllously,

darkly membranous to carbonous, 70–100 μ in diameter; ostiole round, 10–15 μ wide; rostrum 15–20 μ high, 12–20 μ broad, completely erumpent. Spores hyaline, continuous, mostly appearing biguttulate, oval to elliptic, 3–4 × 6.5–8 μ.

On *Avena sativa*.

Piper City, Ford County, June 19, 1925. Acc. No. *2415* (type).

Phyllosticta menispermicola Tehon & Daniels, n. sp.

Spots diaphyllous, light brown to tan, circular when small, very irregular when large, 5 mm. to 5 cm. wide, with a slightly raised, dark, red-brown margin 1 mm. wide; on the under side darker and nearly concolorous. Pycnidia few, sparsely scattered over most of the spot, though occasionally in small clusters, spherical to somewhat applanate, distinctly membranous, lying in the mesophyll, 75–110 μ in diameter, opening epiphyllously by means of a slightly protruding, round to oval ostiole 10–17 μ wide. Spores hyaline to greenish, uniformly oval, continuous, not guttulate, 3.5–4 × 3–3.5 μ.

On *Menispermum canadense*.

Porterfield, Marshall County, August 22, 1922. Acc. No. *8039* (type).

Comparison of this material with the type specimen of *Phyllosticta abortiva* Ellis & Kellerm., furnished through the courtesy of the New York Botanical Garden, which is also on this host, reveals the fact that the earlier species, said to have "spores imperfectly developed," is not a *Phyllosticta* but a *Septoria*. We redescribe it as follows:

Septoria abortiva (Ellis & Kellerm.) Tehon & Daniels, n. comb., description emended.

Synonym: *Phyllosticta abortiva* Ellis & Kellerm. Jour. Myc. **1**: 4. 1885.

Spots diaphyllous, subcircular to somewhat angular, 0.25–1.5 cm. wide, dark grayish-brown above with a definite, blackish, slightly raised border 0.5 mm. wide, grayish-green below with a very narrow margin. Pycnidia abundant, scattered thickly throughout the spots, spherical, innate, occupying the mesophyll, membranous, 60–85 μ in diameter, opening epiphyllously through a very slightly raised, large, round ostiole usually half as wide as the pycnidium; mostly sterile. Spores acicular, hyaline, continuous to 4-septate, straight or curved, 17–23 × 1–1.5 μ.

On *Menispermum canadense*.

W. A. Kellerman, No. *702*, Manhattan, Kansas, Nov. 1884 (type; also the type of the synonym). In the herbarium of the New York Botanical Garden.

Phyllosticta illinoensis Tehon & Daniels, n. sp.

Spots diaphyllous, subcircular, becoming dehiscent, 3–4 mm. in diameter, brown to cinereous above, tan below, margin dark brown. Pycnidia few to many, scattered, occupying the mesophyll, spherical to applanate-globose, membranous, 70–120 μ in diameter, opening through either epidermis by a round, slightly protruding, somewhat carbonous ostiole 10–20 μ wide. Spores bacillar, oblong, straight, ends obtuse, hyaline to smoky, continuous, 3–5 $\times$ 2 μ; issuing from mature pycnidia in fuliginous cirrhi.

On *Sassafras variifolium*.

Grand Tower, Jackson County, August 17, 1922. Acc. No. *574* (type). Also at Coxeyville, Monroe County, August 24, 1922. Acc. No. *5096*.

It has seemed best to make this species distinct from *P. Sassafras* Cooke. Current specimens of Cooke's species are sterile, thus permitting no accurate comparison; but a comparison of the description of his species and our specimens presents inconsistencies of pycnidial size, and of spore shape and size, sufficient to warrant specific segregation, as may be seen in the following:

Pycnidia up to 100 μ in diameter; spores ellipsoid-lanceolate, 1.5 $\times$ 7 μ ..... *P. Sassafras.*
Pycnidia up to 120 μ in diameter; spores bacillar-oblong, 2 $\times$ 3–5 μ ..... *P. illinoensis.*

Phyllosticta circuligerens Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, brown to almost black, 1 mm. to 1 cm. in diameter, unlimited, without margins, by confluence involving the entire leaf blade, becoming friable and eventually crumbling away, strongly marked with concentric ridges between which the leaf tissue has collapsed. Pycnidia few, irregularly scattered, developed in and occupying the mesophyll, apparent amphiphyllously as protrusions in the collapsed tissue, opening hypophyllously by a non-rostrate, slightly carbonous ostiole, membranous and yellow, not carbonous except a small circle about the ostiole, 75–165 μ in diameter. Ostiolar opening ir-

regularly circular, 14–21 μ wide. Spores hyaline, continuous, oval to oblong, with rounded ends, 3–4 × 3.7–8 μ.

On *Rumex altissimus*.

Dongola, Union County, August 12, 1922. Acc. No. *1007* (type).

Phyllosticta chenopodiicola Tehon & Daniels, n. sp.

Foliicolous; spots several per leaf, diaphyllous, 2–4 mm. in diameter, circular, definitely limited, emarginate, light tan to cinereous, not friable. Pycnidia few per spot, gregarious, closely crowded in the center of the spot, developed in and occupying the spongy parenchyma of the leaf, opening epiphyllously by means of a non-rostrate ostiole 7–10 μ wide which lies in a small, carbonous clypeus beneath the cuticle, spherical to applanate, 75–90 μ in diameter. Spores continuous, hyaline, 2–2.5 × 4–8 μ, straight, oblong, with rounded ends, borne on hyaline, needle-like conidiophores 12–20 μ long. PLATE 11, FIG. 6.

On *Chenopodium album*.

Lincoln, Logan County, July 22, 1925. Acc. No. *6309* (type); Mason City, Mason County, July 22, 1925. Acc. No. *10190*; Nashville, Washington County, August 13, 1925. Acc. No. *16667*.

The *Phyllostictae* occurring on *Chenopodia* may be distinguished as follows:

Spores monomorphic.
  Spores curved.
    Spores allantoid.
      Spores 3 × 5 μ, pycnidia 50 μ in diameter ..... *P. Chenopodii.*
      Spores 1.5 × 4–5 μ, pycnidia 70–80 μ in diameter. *P. ambrosioides.*
    Spores merely curved, cylindric-ovate ..... *P. Atriplicis.*
  Spores straight, oblong, 2–2.5 × 4–8 μ, pycnidia 75–90 μ in diameter ..... *P. chenopodiicola.*
Spores dimorphic ..... *P. dimorphospora.*

Macrophoma Zeae Tehon & Daniels, n. sp.

Spots diaphyllous, very extensive, 3–4 cm. wide, 5–10 cm. or more long, irregular in shape, tan with a slightly darker margin, unlimited. Pycnidia abundant, occurring throughout the spot, round to oval or even lenticular in cross section, spherical to applanate in long section, developing in and occupying the mesophyll, membranous, becoming carbonous with age, 65–120 μ in diameter; ostiole protruding hypophyllously, usually through a

stoma, non-rostrate, oval, 15–17 × 28–35 μ. Spores continuous, hyaline to greenish, fusiform, 6.5–8.5 × 17–31 μ.

On *Zea Mays*.

Bushton, Coles County, July 29, 1925. Acc. No. *1247* (type).

Sirococcus Phlei Tehon and Daniels, n. sp.

Caulicolous. Not maculicolous. On dead stems through their length. Pycnidia abundant, in longitudinal rows lying in the chlorenchymatous prosenchyma, usually closely appressed to the intervening sclerenchymatous strands, spherical to applanate, not erumpent, membranous to dark brown, 75–225 μ in diameter, protruding only very slightly by a circular ostiole 25–50 μ wide. Spores catenulate, continuous, hyaline, very broadly oval, 2.5–4 × 4.5–8 μ, borne on hyaline, clavate conidiophores 4–6 μ long.

On *Phleum pratense*.

New Berlin, Sangamon County, July 25, 1925. Acc. No. *14799* (type).

Cytospora sambucina Tehon & Daniels, n. sp.

Caulicolous; producing extensive, oval, yellowish to cinereous cankers which, by confluence, occupy large portions of the internodes. Stromata numerous, irregularly scattered, not crowded, erumpent through the cuticle by a black, compound ostiole ¼–¾ mm. wide, developed in and occupying the cortex between the cuticle and the xylem, the mycelium dissolving and destroying all the cells of the invaded portion. Locules several per stroma, irregularly shaped, with individual ostioles; walls indefinite and membranous toward the periphery of the stroma but elsewhere definitely carbonous. Spores hyaline, allantoid, non-septate, 4–6.5 × 1–2.5 μ.

On *Sambucus canadensis*.

Oregon, Ogle County, August 26, 1922. Acc. No. *7426* (type).

Cytospora sassafrasicola Tehon & Daniels, n. sp.

Caulicolous; inhabiting the bark of small branches previously injured by fire. Cankers not evident. Stromata thickly distributed through the internodes, 275–675 μ in diameter, diffuse and membranous toward the base, black, compact and carbonous at the apex, developed in and occupying the cortex beneath the epidermis, the mycelium disorganizing the cortical cells and infrequently occupying the epidermal cells. Locules few, extensive, irregularly shaped, about 100–375 μ broad, opening by

separate ostioles which converge toward the erumpent center of the stroma. Spores continuous, allantoid, hyaline, 3–7.5 × 1.5–2.5 μ.

On *Sassafras variifolium*.

Olney, Richland County, June 14, 1924. Acc. No. *12161* (type).

SPHAEROPSIS SMILACINA Peck

On *Smilax hispida*.

Boaz, Massac County, Acc. No. *1127*; Buncombe, Johnson County, Acc. No. *2509*; Eagle Mountain, Saline County, Acc. No. *14420*; Anna, Union County, Acc. No. *306*; Seymour, Champaign County, Acc. No. *10733*.

Dearness,[6] after an extensive examination of type specimens, has concluded that this is but one of the polymorphs of *Phyllosticta smilacina* (Peck) Dearn., for which he gives an extensive synonomy including forms described as, or thought to be, *Ascochyta*, *Sphaeropsis*, *Stagonospora*, *Phoma*, *Macrophoma*, and *Phyllosticta*. Unfortunately, transference of the specific name used under *Sphaeropsis* by Peck to *Phyllosticta* introduces a conflict with *P. smilacina* Speg.[7] published in 1899. As we adhere to the dictum that the classification of the Fungi Imperfecti is entirely artificial and based, between genera at least, wholly upon morphology, we prefer to retain the original combinations as designations of the several polymorphs, if such they are, recognizing only the morphology exhibited by an individual and ignoring demonstrated or supposed genetic connections between them.

The fungus, as we find it in Illinois, bears continuous, distinctly colored, brownish-yellow spores, which are not admissible to the usual concept of *Phyllosticta* but which coincide with Peck's description and are admissible to *Sphaeropsis*.

Sphaeropsis Ampelopsidis Daniels, n. sp.

Caulicolous; inhabiting extensive areas on dead stems. Spots and cankers absent. Pycnidia numerous, spherical to applanate, 300–450 μ in diameter, developed in and occupying the cortical tissues beneath the corky exfoliation, closely gregarious in groups

[6] Mycologia **9**: 351–352. 1917.

[7] Fung. Argent. novi vel crit., p. 315. 1899.

which are widely spaced, often contiguous and the walls then confluent; the groups erumpent through the bark and visible as small warts. Ostiole very slightly raised, round, 15–35 μ wide. Spores oblong, with rounded ends, continuous, dark-olivaceous or brown, 17–25 × 7–10 μ.

On *Ampelopsis quinquefolia*.

Fisher, Champaign County, October 20, 1925. Acc. No. *2541* (type).

Sphaeropsis Profundae Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, 1–3 per leaf, circular, tan, 0.5–1 cm. in diameter, with a distinctly brown border 0.5 mm. wide, often surrounded by a chlorotic halo 1–3 mm. wide, becoming friable and crumbling away in age. Pycnidia few, usually 10 or 12 per spot, arranged in an indefinite circle toward the periphery, lying in the mesophyll and opening amphiphyllously by a slightly protruding ostiole, membranous to carbonous, spherical to applanate, 150–200 μ in diameter; the ostiole uniformly 15–18 μ wide. Spores oblong or broadly ovate, dark brown, usually biguttulate, often appearing slightly allantoid in profile, 14–25 × 7–11 μ.

On *Fraxinus profunda*.

Fountain Bluff, Jackson County, June 20, 1924. Acc. No. *17554* (type).

This differs from *S. pennsylvanica* Berk. & Curt. in pycnidial and spore characters, and is certainly different from *S. hyalina* Berk. & Curt. which is now properly known as a *Macrophoma*.

Ascochyta Elymi Tehon & Daniels, n. sp.

Foliicolous; spots dark brown, long and narrow, parallel and adjacent ones often involving large areas of the leaf, causing it to wilt and die at the tip. Pycnidia few per spot, in longitudinal rows between the leaf veins, circular in cross section and conic-truncate in long section, wall very thin, membranous, scarcely distinguishable, with sporiferous mycelium localized in the base of the pycnidium, 60–120 μ in diameter, developed in and occupying the mesenchyma from epidermis to epidermis. Ostiolar opening poorly defined, up to 30 μ wide, protruding through the epidermis, openings amphiphyllous. Spores hyaline, varying from oblong to spindleform, usually straight, but often curved, 1-septate, the septum strictly median, each cell provided with a single guttulum. 10–14 × 2–3 μ.

On *Elymus virginicus*.

Jacksonville, Morgan County, July 25, 1925. Acc. No. *3334* (type).

The distinction between this species and *A. graminicola* Sacc. lies in its pycnidia, the walls of which are very thin and scarcely distinguishable, in contrast with the distinctly parenchymatic, fuliginous ones of Saccardo's species.

Ascochyta biguttulata Daniels, n. sp.

Foliicolous; spots diaphyllous, white to tan, angular, up to 1 mm. broad, becoming confluent and forming circular spots 1 cm. or more wide, friable with age and crumbling away. Pycnidia abundant, scattered throughout the spot, developed in and occupying the mesophyll, spherical to applanate, 75–150 μ (mostly 100 μ) in diameter, membranous, opening hypophyllously by a circular, very slightly protruding, concolorous ostiole quite uniformly 15–16 μ wide. Spores hyaline, very regularly and symmetrically navicular-fusiform, uniformly and very distinctly biguttulate, excepting rarely the largest 3-guttulate, the guttules often 2–2.5 μ in diameter, 3–4 $\times$ 8–14 μ, becoming 1-septate at maturity. PLATE 11, FIG. 7.

On *Polygonum Convolvulus*.

Urbana, Champaign County, October 11, 1925. Acc. No. *2438* (type).

Diplodia Sambuci Tehon & Daniels, n. sp.

Caulicolous; inhabiting extensive cankers, in company with a *Cytospora*, on small and medium sized twigs. Pycnidia spherical, carbonous, 150–225 μ in diameter, erumpent through the cuticle by a slightly raised ostiole whose opening is 15–20 μ wide, very abundant, irregularly scattered, developed in and occupying a dense hyphal subiculum which lies just below the cuticle, parasitizing, dissolving, and destroying the cells of the epidermis, the cortex, and the cambium. Spores narrowly elliptic, olivaceous to brown and in age not translucent, 1-septate, slightly constricted at the septum, 7.5–10 $\times$ 14–21 μ.

On *Sambucus canadensis*.

Oregon, Ogle County, August 26, 1922. Acc. No. *7073* (type).

Septoria festucina Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, brown, at first limited laterally by the veins, 1–10 mm. long, later often involving entire leaves

and killing them. Pycnidia numerous, often crowded and contiguous, developed in and occupying the mesophyll, brown, membranous, opening amphiphyllously; small ones spherical and about 75 μ in diameter; large ones compressed laterally, lying in 2 rows between the veins, and reaching a length of 225 μ. Ostiole round or oval, conforming to the shape of the pycnidium, not rostrate, hardly protruding, 15–30 μ wide. Spores hyaline, acicular, straight or curved, non-septate, 35–70 $\times$ 1–1.5 μ.

On *Festuca elatior*.

Tallula, Menard County, June 16, 1922. Acc. No. *9224* (type).

Our belief that this *Septoria* is not *S. Tritici* is prompted by a wide acquaintance with that fungus and finds further support in the narrow host range shown for it by Weber.[8] As illustrated by Sydow's Mycotheca Germanica No. *1185*, *S. Festucae* Died. is certainly distinct. The species now reported on *Festucae* can be separated as follows:

Spores 30 μ or more long.
  Spores septate.
    Spores 3-septate, 32–40 μ long ..... *S. Festucae-sylvaticae.*
    Spores 3–7-septate, 40–70 μ long ..... *S. Tritici.*
  Spores not septate, 35–70 μ long ..... *S. festucina.*
Spores short, 15–25 μ long ..... *S. Festucae.*

Labrella Aspidistrae Tehon & Daniels, n. sp.

Foliicolous; not maculicolous; occupying the entire leaf blade and petiole, which it kills. Diseased leaves not shrunken or rotted, but lax and wilted, becoming light tan to cinereous when dried. Pycnidia amphigenous, produced in great abundance throughout the diseased tissue, irregularly scattered, subcircular to oval in outline, 140–150 μ in diameter, flat, membranous, developed in and occupying the mesophyll of the leaf, opening by a linear slit which splits the pycnidium into nearly equal halves. Spores oblong to obclavate, hyaline, continuous, 10–18 $\times$ 3.5–4 μ, borne on short, simple, hyaline conidiophores 2.5–5 μ long.

On *Aspidistra* sp.

Libertyville, Lake County, June 9, 1922. Acc. No. *7648* (type).

Pestalozzia Heucherae Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, dark brown, circular, with a darker, red-tinted, narrow, raised margin, 1–3 mm. in diameter,

[8] Phytopathology **12**: 537. 1922.

generally isolated but capable of confluence and then destroying large areas of leaf tissue; concolorous above and below. Acervuli developed in the mesophyll, visible amphiphyllously because of the shrinking of parasitized tissue, opening strictly epiphyllously, often crowded in the spot, membranous, 75–150 μ in diameter. Spores mostly 4-septate, rarely 3-septate, fusiform, in profile somewhat falcate, slightly constricted at the septa, 14–25 × 5–7 μ; central cells dilute brown with dark brown septa and lateral walls; terminal cells hyaline with hyaline walls, the basal one long-conic and drawn out into a single hyaline bristle 10–20 μ long and 0.5 μ wide, the apical cell short-conic with 2 or rarely 3 spreading, hyaline bristles 10–20 μ long and 0.5 μ wide. Conidiophores hyaline, cylindric, with tapered apex, 2–8 μ long. PLATE 11, FIG. 8.

On *Heuchera parviflora*.

Fountain Bluff, Jackson County, June 20, 1924. Acc. No. *2873* (type).

Septocylindrium Hydrophylli Daniels, n. sp.

Foliicolous; spots diaphyllous, at first round, 1–3 mm. in diameter, black, becoming extensive, irregular, friable, and occupying large areas of the leaf, which eventually fall away. Fasciculae very few, hypophyllous, small, loose, consisting of 3–10 hyphae. Conidiophores hyaline, minute, nonseptate, simple, erect, straight, 4–12 × 2.5–3 μ. Spores hyaline, bacilliform to oblong-cylindric, non-septate *in situ*, catenulate in 2 rows from the apex of the conidiophore, 7–15 × 2.5–3 μ. PLATE 11, FIG. 9.

On *Hydrophyllum canadense*.

Seymour, Champaign County, October 15, 1925. Acc. No. *9531* (type).

Cercospora Hyperici Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, chiefly near the margins, circular when small, extending circularly over the blade until the midvein is reached, dark brown above and concolorous, lighter brown below, unlimited and without a margin, 1–4 mm. wide, sometimes confluent. Fasciculae strictly hypophyllous, very abundant, crowded in the center of the spot, of 3–50 or more conidiophores, which arise from a prominent, cellular tubercle. Conidiophores upright, straight below but tortuous above from spore abscission, continuous, olivaceous, without geniscars, 14–20 × 3–4 μ. Spores hyaline, subcylindrical to obclavate, straight, ends obtuse but not blunt, continuous to 4-septate, 15–25 × 3–4 μ.

On *Hypericum adpressum*.

Bement, Piatt County, July 6, 1925. Acc. No. *13035* (type).

Cercospora Podophylli Tehon & Daniels, n. sp.

Foliicolous; spots diaphyllous, round or elongate, 0.5–1 mm. wide, 0.5–10 mm. long, cinereous, with a narrow, brown, limiting margin; subject to invasion by an *Alternaria*, which results in extensive foliar necrosis. Fasciculae absent. Conidiophores appearing singly or in pairs, strictly epiphyllous, subhyaline to olivaceous, 2–3-septate, clavate, apex obtuse; geniscars absent. Spores hyaline, long-cylindric to navicular, both ends acute, 3–5-septate, 35–55 × 3–6 μ.

On *Podophyllum peltatum*.

Jersey County, August 2, 1922. Acc. No. *12950* (type).

Cercospora Silphii Ellis & Ev. var. **laciniati** Tehon & Daniels, n. var.

Foliicolous; spots dark brown to black, usually near or on a large vein, angular, 1–3 mm. wide, distinctly hypertrophied. Fasciculae rare, small, of from 4 to 7 hyphae. Conidiophores upright, light-olivaceous, 1–3-septate, 30–50 × 3.5–4.5 μ. Spores hyaline or nearly so, straight or curved, somewhat obclavate, 6–10-septate, 70–90 × 3.5–4 μ.

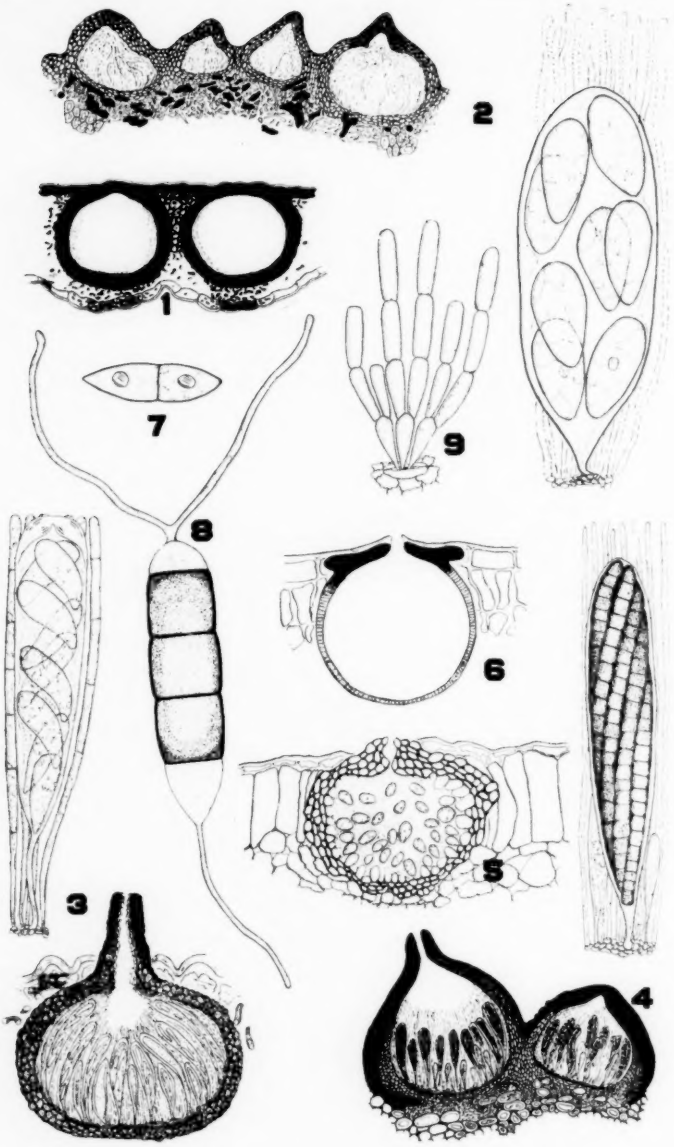
On *Silphium laciniatum*.

Bement, Piatt County, July 6, 1925. Acc. No. *15262* (type).

This differs but slightly from the species, and then in respect especially to the conidiophores and spores. The difference in spots is probably ascribable to host reaction.

Cercospora setariicola Tehon & Daniels, n. sp.

Foliicolous; spots at first small, broadly oval, dark brown, lying between the larger veins, 0.5–1 mm. long, becoming elongate-elliptic with a cinereous, nonfriable center and an unraised, sharply limited, brown border; sometimes confluent. Fasciculae strictly hypophyllous, erumpent in rows through the interveinular stomata, not numerous or crowded, composed of 50 or more conidiophores which arise from a dark, compact, oval, flat tubercle measuring 15–17 × 30–36 μ. Conidiophores straight, erect, continuous or 1-septate, 17–40 × 3–4 μ, translucent, light olivaceous, tapering to a definitely conic apex, with small but marked internal geniscars. Spores straight or sometimes



PARASITIC FUNGI OF ILLINOIS

slightly curved, acicular, hyaline, 4–12-septate, 30–90 × 3–4 μ; geniscar small but marked, internal.

On *Setaria glauca*.

Macomb, McDonough County, August 16, 1924. Acc. No. *11542* (type); Oquawka, Henderson County, August 15, 1924. Acc. No. *7905*.

This species is readily distinguishable from the two other ones now known on *Setariae*, as the following shows:

Conidiophores long, 50–120 μ.
  Spores 20–150 × 4–5 μ..... *C. Setariae.*
  Spores 45 × 1.5 μ..... *C. striaeformis.*
Conidiophores short, 17–40 μ..... *C. setariicola.*

In fact, its characteristics are essentially those of a *Scolecotrichum*, except for its undoubtedly scoleciform spores.

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EXPLANATION OF PLATE 11

Fig. 1. Cross section of the stroma of *Phyllachora Cinnae*, showing the opposite locules, the well developed epiclypeus, and the indefinite hypoclypeus.

Fig. 2. Ascus and spores of *Nitschkia Polygoni*; also a section through a group of perithecia which shows the hyphal subiculum upon which they rest.

Fig. 3. Ascus and a section of a perithecium of *Rostrosphaeria Phlei*.

Fig. 4. Ascus and spores, and a section of two joined perithecia of *Exilispora plurisepta*.

Fig. 5. Section through a pycnidium of *Phyllosticta Gymnocladi*.

Fig. 6. Diagrammatic section of a pycnidium of *Phyllosticta chenopodiicola*, showing the clypeus about the ostiole.

Fig. 7. A spore of *Ascochyta biguttulata*.

Fig. 8. A spore of *Pestalozzia Heucherae*.

Fig. 9. A fascicle and spores of *Septocylindrium Hydrophylli*.

CONTRIBUTIONS TO OUR KNOWLEDGE OF OREGON FUNGI—II MYCOLOGICAL NOTES FOR 1925

S. M. Zeller

(With 3 Text Figures)

In continuation of previous notes on Oregon fungi[1] I am presenting here a list of fungi which have never been reported from the state before or concerning which some notes of interest have been obtained.

PHYCOMYCETES

Family 1. Peronosporaceae

1. Plasmopara ribicola Schröt.
   On gooseberry, Coquille. June. No. *2505*.

ASCOMYCETES

Family 2. Erysiphaceae

2. Erysiphe Cichoracearum DC.
   On *Phlox* sp., Corvallis. July. No. *2362*.
3. Erysiphe Polygoni DC.
   On *Polygonium*, Corvallis. August. No. *2542*.
4. Phyllactinia corylea (Pers.) Karst.
   On cultivated filbert, leaves affected near the ground, Hood River. November. No. *2608*.

Family 3. Sphaeriaceae

5. Fracchiaea callista (Berk. & Curt.) Sacc.
   On bark of *Cornus*, Corvallis. April. No. *2002*.
6. Valsa Abietis Fries.
   On *Pseudotsuga taxifolia*, Corvallis. December. No. *2507*.

[1] Zeller, S. M. Contributions to our knowledge of Oregon fungi—I. Mycologia **14**: 173–199, *fig. 1–6*. 1922.

7. VALSA AMBIENS Fries.

On apple, Alvadore. February. No. *2494.*

8. EUTYPELLA PRUNASTRI (Pers.) Ellis & Ev.

On winter-injured apple bark, Hood River. March. No. *2458.*

9. VALSELLA PAPYRIFERAE (Schw.) Berl. & Vogl.

In apple bark, Hood River. January. Frequently on winter-injured bark. No. *6867.*

The Oregon collections are as near to the above as any reported species. Unfortunately the description is incomplete and if the present collection is to be included the following notes should amend the description:

Stroma circular, with 7–10 perithecia, seated on a white stroma limited by a black exterior; perithecia globose with a neck; asci 16-spored, 50–60 × 10–13 μ; spores hyaline, allantoid, 8–11 × 1.5–2 μ.

10. EUTYPA FLAVOVIRESCENS (Hoff.) Sacc.

On dead wood, Corvallis. Infrequent. February. No. *6887.*

11. EUTYPA LATA (Pers.) Tul.

On dead hard wood, Blue River. March. Epling No. *610.*

12. DIATRYPE BULLATA Fries.

On alder, Corvallis. March. Infrequent. No. *6888.*

13. CHAETOMIUM GLOBOSUM Kunze.

On pear canker, Grants Pass. September. No. *2364.*

14. ROSELLINIA PULVERACEA (Ehr.) Fuckel.

On decay wood (*Quercus*), Philomath. Common. Epling No. *553.*

15. ANTHOSTOMA GASTRINUM (Fries) Sacc.

On alder?, Blue River. Infrequent. March. Epling and Shorett No. *664.*

16. XYLARIA HYPOXYLON (L.) Grev.

On cultivated gooseberry in several localities in the Willamette Valley. April. No. *2528.*

This species has been found as a root rot of the cultivated gooseberry producing the characteristic black root rot with heavy,

black encrustations of the affected roots as described for the black root rot of apple.[2] The stag-horn conidial and ascigerous fruiting bodies appear at the ground line around the affected plants. When one root is affected the branches on that side of the plant may have small yellowed leaves, which drop early, and such branches die before the next season.

17. XYLARIA POLYMORPHA (Pers.) Ellis & Ev.

On roots of apple tree, Corvallis. March. Infrequent. No. *2273*.

18. XYLARIA RHOPALOIDES (Kunze) Mont.

On rotted wood. Corvallis. March. Frequent. No. *2274*.

19. USTULINA VULGARIS Tul.

On decayed wood, Corvallis. March. Infrequent. No. *2234*.

20. HYPOXYLON ATROPURPUREUM Fries.

On alder, Corvallis. October. Infrequent. Epling No. *237*

"This species does not seem to be well understood by any authors of Exsiccati. It closely resembles a form collected by E. A. Burt and referred to *H. atropurpureum* by him."—Epling.

21. HYPOXYLON COHAERENS (Pers.) Ellis & Ev.

On *Quercus*, north of Corvallis. August. Frequent. No. *1807*.

22. HYPOXYLON FUSCUM (Pers.) Ellis & Ev.

On dead alder, Corvallis. March. Common. No. *2256*, *2485*.

23. HYPOXYLON MULTIFORME Fries.

On alder, Alsea Mountain and Corvallis. March. Infrequent. No. *6889*, *6900*.

24. NUMMULARIA BULLIARDI Tul.

On dead oak bark, Corvallis. April. Frequent. No. *6886*.

Characterized by the broad black stroma which has at the margins the remnants of the thick coriaceous, membranaceous veil which originally covers the stroma.

25. NUMMULARIA PUNCTULATA (Berk. & Rav.) Sacc.

Blue River. Collected by Epling and Shorett, No. *565*. March.

[2] Fromme, F. D., & H. E. Thomas. Black root-rot of the apple. Jour. Agr. Res. **10**: 163–174. 1917.

26. GNOMONIA ALNI Plowr.

On *Alnus oregona*, Corvallis. October. No. *2515, 2453.*

27. GNOMONIA RUBI Rehm.

On dead canes of black and red raspberry and loganberry, Corvallis and Springbrook. Frequent. January to June. No. *2472, 2643, 2655.*

Overholts (Mycologia **18**: 34. 1926) has recently reported this fungus from Vermont, it having been previously reported from the Eastern states by Edgerton (Bull. Torrey Club **34**: 593. 1907). This, however, is the first report of the organism from the western United States.

The specimens found have not been in a parasitic condition. The canes affected have been previously killed, perhaps by winter injury. The fungus is rather typical. Perithecia 200–240 × 160–200 μ; asci 4-spored, 50 × 6–9 μ; spores 12–16 × 2.5–4 μ, one-septate. In one case on black raspberry the acervuli of a *Myxosporium* was associated with the perithecia. These acervuli were creamy-waxy, 50–100 μ broad, circular to elliptic, conidiospores ellipsoid, hyaline, not guttulate or granular, 7–9 × 2–3 μ.

28. GNOMONIA SETACEA (Pers.) Ellis & Ev.

On loganberry, Corvallis. January. No. *2472.*

29. APIOSPORA POLYPORI Ellis & Ev.

On *Fomes applanatus*, Corvallis. March. Infrequent. No. *2259.*

30. MYCOSPHAERELLA BRASSICAECOLA (Duby) Lindau.

On broccoli leaves, Roseburg. March. No. *2525.*

31. BERTIA MORIFORMIS (Tode) De-Not.

On maple wood, Benton County. Infrequent. Epling No. *270.*

32. MELANOPSAMMA POMIFORMIS (Pers.) Sacc.

On winter-injured apple bark, Corvallis. December. No. *2487.*

33. SPHAERULINA INTERMIXTA (Berk. & Br.) Sacc.

On cultivated black raspberry, Corvallis. January. Common. No. *2477, 2659.*

This species is reported from Europe on *Rubus laciniatus* var.

fruticosus and *R. Idaeus*. It perhaps is widespread in America. The spores are strikingly similar to those of some species of *Mycosphaerella* except they are 3–5-septate, 16–23 × 6–9 μ.

34. SPHAERULINA TAXI (Cooke) Massee.

On leaves of *Taxus baccata*, Corvallis. February. Infrequent. No. *6879*.

This causes a disease of the leaves of yew, which are browned, after infection. The Oregon material is typical, having 8-spored asci, with spores 3–4-septate, hyaline, 16–20 × 5–7 μ.

35. PLEOSPORA HERBARUM (Pers.) Rabenh.

On *Asparagus* and *Rubus* stems, Hood River and Gresham. Frequent. March and April. No. *2656*, *6894*.

36. LEPTOSPHAERIA AGMINALIS Sacc. & Morth.

On *Clematis*, Ashland. September. No. *2581*.

37. **Leptosphaeria Arunci** n. sp.

Perithecia dark brown to black, erumpent, scattered, globose to slightly depressed, 120–240 μ in diameter, with slightly papil-

FIG. 1. Ascus and ascospores of *Leptosphaeria Arunci* Zeller.

late ostiole 16–24 μ in diameter; *paraphyses* filiform, hyaline, granular-guttulate; *asci* exceedingly clavate, the long, narrow

stipe with granular, hyaline endoplasm, 88–115 × 10–13 μ. *Spores* dark brown, eight, crowdedly distichous above to obliquely monostichous below, 3-septate, constricted, guttulate, 18–24 × 7–9 μ (TEXT FIG. 1).

On dead stems of *Aruncus silvester*, Multnomah Falls. April. (Type in Zeller Herb. *6811* and in O. A. C. Herb. *4851*.)

38. LEPTOSPHAERIA THOMASIANA Sacc. & Roum.

On dead loganberry canes, Corvallis. February. No. *2460*.

This fungus causes gray patches on the canes. These are dotted with the black erumpent perithecia in the central portions but toward the margin of the patches are found pycnidia of a *Phoma* having conidia measuring 3–6.5 × 2–3 μ. This association of *Phoma* with this *Leptosphaeria* is almost constant but its organic connection has never been demonstrated.

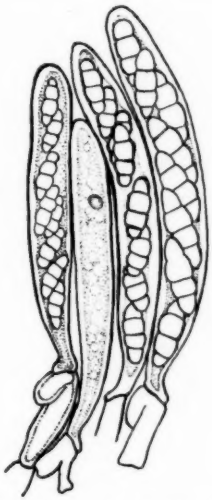

FIG. 2. Immature and mature asci of *Leptosphaeria Thomasiana* Sacc. & Roum.

The perithecia are gregarious, globose to broadly conic, with very obtusely papillate ostiole, dark brown to black, erumpent, 160–340 μ in diameter; asci terete to narrowly clavate, short-stipitate, 75–96 × 8.5–12 μ; spores 1–2-seriate, olivaceous, fusoid, 3-septate, slightly constricted at maturity, 17–22 × 6.5–8 μ.

The illustration (TEXT FIG. 2) shows immature and mature asci as they arise from the crest of hooks from the ascogenous hyphae.

In western Washington a cane blight has been ascribed to this *Leptosphaeria* under the name *L. Coniothyrium*. The latter species has never been found by the writer in its ascogenous stage in western Oregon or Washington, although the imperfect stage (*Coniothyrium Fuckelii* Sacc.) was found on a dead cane of the Cuthbert red raspberry at Corvallis and on Himalaya blackberry and Cumberland black raspberry at Newberg. Material sent from the Western Washington Experiment Station, Puyallup, Washington, March 3, 1917, under the name of "Loganberry gray bark disease" proves to be *Lepotosphaeria Thomasiana*. The two common fungi on *Rubus* canes in western Oregon and Washington to which a cane blight might be attributed are *Mycosphaerella rubina* (Peck) Jacz. and *Ascospora Rubi* (West.) Zeller. The *Phoma* and *Coryneum* stages, respectively, of these are more commonly found than their ascogenous stages and much more commonly than the rarely found *Coniothyrium*.

39. DIDYMELLINA IRIDIS (Desm.) v. Höhn.

On *Iris*, Brooks. April. Common. No. *6828*.

40. MELANOMMA PULVIS-PYRIUS (Pers.) Fuckel.

On dead poplar wood, Corvallis. November. Infrequent. Epling No. *264*.

Family 4. HYPOCREACEAE

41. HYPOMYCES LACTIFLUORUM Schw.

On *Russula delica*, Benton County (Alsea Mountain). August. No. *2548*.

42. NECTRIA DEPAUPERATA Cooke.

On Kentia palm, Portland. Collected by H. S. Jackson (O. A. C. Herb. *1844*).

43. NECTRIA PUNICEA Fries.

On *Juglans*, Corvallis. February. No. *6875*.

Perithecia are dark purplish red and spores are 16–23 × 6–7.5 μ.

Family 5. DOTHIDEACEAE

44. PLOWRIGHTIA RIBESIA (Pers.) Sacc.

On cultivated currant, Corvallis, Woodburn, Springbrook. December to April. Frequent. No. *2473, 2529, 2533.*

45. PLOWRIGHTIA MORBOSA (Schw.) Sacc.

On *Prunus emarginata*, Benton County. April. Frequent. (Epling.) No. *2292.*

Family 6. HYSTERIACEAE

46. HYPODERMA VIRGULTORUM DC.

On canes of red raspberry, Alpine, Gresham, and Newberg. March to May. Frequent. No. *6916, 6895, 6901.*

The perithecia are shiny black, lenticular, opening by a longitudinal slit. Asci are stipitate clavate, 95–125 × 7.5–9 μ; spores at first 1-celled, then 2-celled, 2-guttulate, 17–24 × 1.2–3 μ. The paraphyses are characteristically corkscrew twisted at the tips.

47. LOPHODERMIUM MACULARE De-Not.

On *Vaccinium ovatum*, Siltcoos Lake, Lane County. February. Infrequent. No. *2233.*

Not previously reported west of the Atlantic states.

48. LOPHODERMIUM RHODODENDRI Ces.

On stems of *Rhododendron californicum*, Alsea Mt., and Blue River. March to June. Frequent. No. *2340*; Epling No. *673.*

This species is usually reported on leaves. No leaf infections were found. The infected areas on living stems were strikingly white with the distinct, black perithecia dotting them.

49. LOPHODERMIUM PINASTRI (Schrad.) Chêv.

On *Libocedrus decurrens*, Blue River. March. Epling and Shorett No. *591.*

Family 7. STICTIDACEAE

50. STICTIS RADIATA (L.) Pers.

On dead stems of *Rhus diversiloba*, Blue River. March. (Epling, *592.*) No. *2309.*

Family 8. DERMATIACEAE

51. DERMATEA CERASI (Pers.) Fries.
On sweet cherry, Corvallis. March. No. *2517*.
Pycnidia of the imperfect stage are also present.

Family 9. MOLLISIACEAE

52. PYRENOPEZIZA RUBI (Fries) Rehm.
On *Rubus leucodermis*, Corvallis. February. No. *2489*.
Our collection exhibits spores measuring 7.5–9 × 1.3–2.5 μ in asci measuring 32–40 × 6–7 μ. This plant may be nearest to variety *tenerior* described from Italy but without material for comparison I refer it as above.

Family 10. HELOTIACEAE

53. CHLOROSPLENIUM AERUGINOSUM (Oeder) De-Not.
On oak, Corvallis. April. Frequent. No. *2287*.

54. PEZIZELLA LYTHRI (Desm.) Shear & Dodge.
On *Rubus*, Corvallis. November. Frequent. No. *2390*.
This material was identified by Dr. B. O. Dodge, and is represented by the pycnidial stage (*Sclerotiopsis*) and the sporodochial stage (*Hainesia*). These stages are frequently found growing saprophytically on the stems and petioles of wild and cultivated species of *Rubus* in this state.

55. CIBORIA CAUCUS (Rebent.) Fuckel.
On aments of *Populus* and *Salix*, Benton County. April.
This fungus collected by Dr. H. M. Gilkey appears very similar to some of the *Sclerotinia* species but the apothecia are not produced from sclerotia. The spores are 8–10 × 5–6 μ and the asci measure 124–128 × 8 μ.

56. DASYSCYPHA AGASSIZII (Berk. & Curt.) Sacc. var. *rufipes* Phill.
On *Pinus monticola*, Hood River. July. No. *2359*, and on *Pinus attenuata*, Corvallis. February. No. *6799*. Infrequent.

57. LACHNELLA RUFO-OLIVACEA (Alb. & Schw.) Sacc.
On dead blackberry canes, Corvallis. March. No. *2516*.
This disco is on the older canes usually clustered at the base of the buds.

Family 11. PEZIZACEAE

58. OTIDEA ONOTICA Fuckel.
In fir woods, Corvallis, November. No. *2384.*

59. HUMARIA MACROSPORA Wallr.
On ploughed land, Corvallis. March. No. *2631.*

60. HUMARIA SACCARDOI Cavara.
On burned-over soil, Corvallis. April. No. *2572.*

61. **Acetabula murina** n. sp.

Cup 2–5 cm. broad, cup-shaped to expanded; *hymenium* mouse gray, drying deep neutral gray to slate color; *outside* lighter, neutral gray drying grayish olive, smooth to slightly radiate sulcate; *stipe* 3–6 cm. long, 5–8 mm. in diameter, costate lacunose, whitish with grayish tints, drying drab to lighter; *asci* cylindrical hyaline, not blue with iodine, 8-spored, 300–340 × 12–14 μ; *spores* ellipsoid with one large vacuole, 17–20.5 × 11–13 μ, smooth, hyaline; *paraphyses* hyaline, slender with straight clavate tip, septate.

In gardens, Corvallis. April. No. *6821, 6942.* Collected by Dr. Helen M. Gilkey.

This species seems to have its nearest affinities with *A. Barlae* Bond. It differs in characters of the stipe, paraphyses, and size and shape of spores. It is called "murina" because of the mouse-color of the cup.

62. ACETABULA VULGARIS (Pers.) Fuckel.
In leaf mold in dense woods, Corvallis. March. No. *2561, 6819.*

63. GALACTINIA PROTEANA (Boud.) Sacc. & Sydow, var. *sparassoides* Boudier.
Under conifers, Corvallis. April. Infrequent. No. *2368.*
Also reported from southern Oregon by Prof. E. R. Lake.

64. PEZIZA STEVENSONIANA Ellis.
On ground in fir woods, Corvallis. April. No. *2560.*

The spores in this collection measure 15–16 × 8–9 μ, and they are smooth and hyaline. Since the spores are smaller I believe the collection is perhaps more correctly referred here than under *P. repanda.*

65. PEZIZA VESICULOSA Bull.

In rich or manured soil, Corvallis. January to June. No. *2622*.

66. PEZIZA PRAETERVISA Bres.

On burned-over soil, Corvallis. February. Frequently found. No. *6874*.

This species is close to *P. violacea* Pers. but differs in its larger size, asperulate spores and hooked paraphyses. The spores are 12–14 × 6–7.5 μ, usually appearing smooth but becoming slightly asperate at maturity. Apothecia are 2.5–7 cm. broad and striking in color, the hymenium "blackish brown (1)" becoming "deep brownish drab" (Ridgway), the exterior slightly lighter with violaceous shades.

67. LACHNEA SCUTELLATA (L.) Gill.

On rotten apple wood, Corvallis. April. Common. No. *2341*.

Family 12. HELVELLACEAE

68. MORCHELLA CONICA Pers.

In lawns, Corvallis. April. Frequent. No. *6818*.

Sporophores up to 12 cm. tall. The spores are 19–21 × 12–14 μ.

69. MORCHELLA ELATA Fries.

Fructification large, 24–28 × 9–14 cm.; *ascoma* conical, 12–14 cm. × 9–14 cm., hollow, of 2 distinct layers, covered by a deep lacunose hymenial tissue with principal ribs longitudinal, netted between with very large lacunae having secondary labyrinthine folds extending to the fundamental cap tissue within, to a maximum depth of 4 cm., tawny olive becoming snuff brown or darker on aging; *asci* cylindrical to clavate, hyaline, not blue with iodine, 15–23 × 200–320 μ, 8-spored; *paraphyses* clavate, 8–15 × 140–250 μ, septate below, terminating in a longer cell about 100 × 12–16 μ; *spores* hyaline, smooth, 17–20 × 12–14 μ; *stipe* subequal to tapering, somewhat crinkled, 12–15 × 3–7 cm., hollow; cavity continuous with the cavity of ascoma; *surface of stipe* glabrous to pruinose-squamulose above, cream-colored to slightly darker; *stipe tissues* of two layers, the outer 2–3 mm. thick, extending above into the ascogenous tissue of the ascoma, the inner more rapid growing and becoming crinkled to cerebriform, even filling the basal portion of the cavity at maturity, extending upward into the ascoma where it becomes perforate or continuous.

Along fence rows in the open, Corvallis. April. Infrequent. No. *6810*, *6878*.

This species is very striking because of its size and stateliness. Massee has reported plants up to 25 cm. high.

70. MORCHELLA PUNCTIPES Peck.

On rich ground, Corvallis. April. Frequent. No. *2651*.

This species belongs to the group *Pileatae*, the ascoma being free about half way up. The photograph (TEXT FIG. 3) illustrates the small conical points which adorn the stem. The whole plant reaches a maximum height of 12 cm. The ascoma is buck-

FIG. 3. *Morchella punctipes* Peck

thorn brown to mummy brown when fresh, drying lighter; stem is translucent cream buff to honey yellow, drying dirty white to drab. *Asci* cylindric, 220–280 × 17–20 μ; *spores* ellipsoid, hyaline, light buff to warm buff in mass, 20–25 × 14–16 μ. The only difference noticed in the Oregon collections is the furfura-

ceous character of the inner surface of the stipe. Peck described it as glabrous.

71. MORCHELLA RIMOSIPES DC.

In open woods, Chapman. April. Infrequent. No. *6817*.

Our plant agrees in every respect except the free cap. In ours *only* the margin of the ascoma is slightly free.

Family 13. EXOASCACEAE

72. **Exoascus Pruni-subcordatae** n. sp.

Mycelium evidently perennial; *asci* clavate, often truncate, sometimes narrowed above, 8-spored, 54–61 × 10–13 μ; *stalk cells* emergent, not wedged between cells of host, 12–16 × 5–11 μ; *spores* ellipsoid to ovate, hyaline, often forming conidia in the asci, 6–10 × 3.5–5 μ (TEXT FIG. 4).

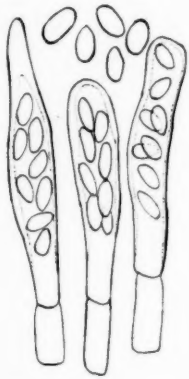

FIG. 4. Asci and ascospores of *Exoascus Pruni-subcordatae* Zeller.

On immature fruits of the Sierra Plum (*Prunus subcordata*) causing plum pockets, Douglas County, Oregon, and Santa Cruz Mts., California. May to June. No. *1084*, *6925*, *6924*.

Wherever this disease of the wild plum occurs it is rarely possible to find healthy fruits. Dr. W. L. Jepson who collected it in California (*6924*) says concerning the specimens: "The enclosed are 'blasted' fruits of *Prunus subcordata* from the Santa Cruz Mts. During many years of botanizing in the Coast Ranges I have never found a mature sound fruit of this species, though such

are common in northeastern California. These Coast Range developments are whitish, bladdery, that is, thin-walled and hollow, 2 to 5 times larger than the dried up samples." The normal mature fruits of *P. subcordata* are ¾ to 1 in. long while many of the plum pockets of immature fruits are upwards of two inches long, usually about 1.5 inches long and variously creased and lobed. The diseased flesh is white and pithy, the surface being whitish and mealy.

Exoascus Pruni-subcordatae is much like *E. longipes* Atk. and *E. communis* Sad. in the shape of the stalk cells but differs in the much larger spores than these species and in its specialized host infection. As stated before,[3] *E. Pruni-subcordatae* seemingly does not infect cultivated varieties of *Prunus* growing nearby the infected wild host.

[3] Zeller, S. M. A "plum pocket" on *Prunus subcordata* in Oregon. Phytopath. **12**: 443. 1922. (Abstract.)

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A MYCOLOGICAL SURVEY OF PORTO RICO AND THE VIRGIN ISLANDS

H. M. Fitzpatrick

[A Review]

During the Spanish occupation of Porto Rico practically no attention was given to the rich fungous flora of the island. Only two collections of fungi were made, and they were small and relatively unimportant. After Porto Rico was annexed by the United States the Insular Department of Agriculture undertook various mycological investigations and incidentally initiated a fungous survey. Between 1900 and the present a number of American botanists, interested in collecting, have visited the island, and several native Porto Rican botanists with training in taxonomic mycology have coöperated with them. In the aggregate a very considerable number of fungi have been collected, and distinct contributions toward a knowledge of various groups have been made. The fungi of Porto Rico are known now probably better than those of any other area of equal size in the American tropics.

The mycological survey of Porto Rico and the Virgin Islands which recently has been published by Seaver and Chardon [1] is a compilation based chiefly on previously published papers, and constitutes an annotated check-list of the known fungi of these Islands. The fungi of the Virgin Islands have been less extensively studied than those of Porto Rico, and are known chiefly from Seaver's collections made in 1923. The survey on the whole is surprisingly complete, and the paper will be of great service to all students of tropical fungi. The material is arranged on the basis of the classification of the fungi, the genera of a

[1] Fred J. Seaver and Carlos E. Chardon (with contributions by *Rafael A. Toro*; *F. D. Kern* and *H. H. Whetzel*; and *L. O. Overholts*). **Botany of Porto Rico and the Virgin Islands: Mycology,** *in* Scientific Survey of Porto Rico and the Virgin Islands **8**[1]: 1–208. 1926. [Published by New York Academy of Sciences.]

family and the species of a genus being listed in alphabetical order. Citations to the places of original publication are given, hosts are listed, and some indication of geographical distribution is attempted. The minimum of synonymy is included. A number of new species and a few new genera are described, full diagnoses being given in every case. The portion of the text covering the higher Basidiomycetes was prepared by L. O. Overholts, that on the rusts and smuts by F. D. Kern and H. H. Whetzel, while R. A. Toro has collaborated on several groups of the Pyrenomycetes and is responsible for the pages on the Pseudoperisporiales. Several other workers have contributed diagnoses of new species in their special groups. In the preface an historical sketch is given of the various activities which led up to the publication of the survey. Generic and host indices are appended.

A critical examination of the pages of the survey reveals certain points worthy of special mention. The scope of the survey includes the Myxomycetes and Schizomycetes as well as the fungi proper. In the first group 41 species are listed, while only 13 species of bacteria are mentioned. In the Phycomycetes a total of only 20 species is given. Only two of these are chytrids. The Ancylistales, Saprolegniales, and Monoblepharidales are unrepresented. The total number of Zygomycetes is seven. In the Ascomycetes there are no subterranean Tuberales or Plectascales, no Laboulbeniales, no Helvellaceae, one species of *Cordyceps*, only two of the Geoglossaceae, one of the Chaetomiaceae and relatively few Pezizales. In the Basidiomycetes fleshy forms are uncommon, there being 4 species of *Clavaria*, 4 of *Hydnum*, few Agaricaceae, and no Hymenogastrales. The rusts are well represented, there being 71 species of *Puccinia* alone. The parasitic fungi imperfecti and Pyrenomycetes occupy a prominent position. There are 65 species of *Cercospora*, 46 of *Phyllachora*, 84 of *Meliola* and 38 of *Asterina*. The Thelephoraceae and Polyporaceae are relatively abundant. It seems likely that knowledge of some of the poorly represented groups will be greatly increased when special emphasis is placed on their collection.

The following new genera, new species, new names, and new combinations occur. In the case of each new combination the older binomial is indicated in brackets.

Aspergillaceae.

CERATOCARPIA WRIGHTII (Berk. & Curt.) Toro, comb. nov. [*Perisporium Wrightii* Berk. & Curt.].

Microthyriaceae.

ASTERINA SPATHULATA (Ryan) Seaver & Toro, nom. nov. [*Asterina Miconiae* Ryan].

ECHIDNODES MICROSPORA (Chardon) Seaver & Toro, comb. nov. [*Lembosia microspora* Chardon].

Hemisphaeriaceae.

ASTERIDIELLINA PORTORICENSIS (Speg.) Seaver & Toro, comb. nov. [*Asteridium portoricense* Speg.].

ASTERIDIELLINA Seaver & Toro, nom. nov. [*Asteridium* Speg.].

Erysiphaceae.

ERYSIPHE MALACHRAE Seaver, sp. nov.

Perisporiaceae.

APPENDICULELLA COMPOSITARUM PORTORICENSIS (Stevens) Seaver & Toro, comb. nov. [*Meliola compositarum* var. *portoricensis* Stevens].

IRENE SEMINATA (Berk. & Curt.) Seaver & Toro, comb. nov. [*Meliola seminata* Berk. & Curt.].

PERISPORINA PORTORICENSIS (Stevens) Seaver & Toro, comb. nov. [*Perisporium portoricense* Stevens].

PHAEODIMERIELLA CAYAPONIAE (Garman) Seaver & Toro, comb. nov. [*Dimerium Cayaponiae* Garman].

Capnodiaceae.

PHAEOSACCARDINULA TENUIS (Earle) Seaver & Toro, comb. nov. [*Antennularia ? tenuis* Earle].

TRICHOTHYRIUM LOMATOPHORUM (Ellis & Ev.) Toro, sp. nov. [*Asteridium lomatophorum* Ellis & Ev. (in herb.)].

Pseudoperisporiaceae.

POROSTIGME MICROSPORA Toro, sp. nov.

PSEUDOPERISPORIUM Toro, gen. nov.

PSEUDOPERISPORIUM ERIGERONICOLA (Stevens) Toro, comb. nov. [*Dimeriella erigeronicola* Stevens].

Nectriaceae.

CALONECTRIA IGNOTA Chardon, sp. nov.

CREONECTRIA LAURENTIANA (Marchal) Seaver & Chardon, comb. nov. [*Nectria Laurentiana* Marchal].

CREONECTRIA RUBROSULPHUREA Seaver, sp. nov.

CREONECTRIA MACROSPORA Chardon, sp. nov.

MACBRIDELLA CINNABARINA Seaver, sp. nov.

NECTRIA ANANATIS Seaver & Chardon, sp. nov.

NECTRIA CONFLUENS Seaver, sp. nov.

OPHIONECTRIA PALICOUREAE Seaver & Whetzel, sp. nov.

SPHAEROSTILBE MAMMIFORMIS Chardon, sp. nov.

THYRONECTRIA MEGALOSPORA (Speg.) Seaver & Chardon, comb. nov. [*Pleonectria megalospora* Speg.].

Phyllachoraceae.

ENDODOTHELLA TETRASPORA C. R. Orton, sp. nov.

PHYLLACHORA CHARDONI C. R. Orton, sp. nov.

PHYLLACHORA MASSINII Toro, sp. nov.

PHYLLACHORA SMILACICOLA Chardon, sp. nov.

PHYLLACHORA VIEQUESENSIS C. R. Orton & Toro, sp. nov.

TRABUTIA ZANTHOXYLII Chardon, sp. nov.

TRABUTIELLA ICHNANTHI (Speg.) Seaver & Chardon, comb. nov. [*Puiggarina Ichnanthi* Speg.].

Clypeosphaeriaceae.

CLYPEOTRABUTIA Seaver & Chardon, gen. nov.

CLYPEOTRABUTIA PORTORICENSIS (Stevens) Seaver & Chardon, comb. nov. [*Trabutia portoricensis* Stevens].

Mycosphaerellaceae.

MYCOSPHAERELLA SACCHARI (Speg.) Seaver & Chardon, comb. nov. [*Sphaerella Sacchari* Speg.].

MYCOSPHAERELLA TETRASPORA Seaver, sp. nov.

Xylariaceae.

HYPOXYLON CITRINUM Shear, sp. nov.

HYPOXYLON LEUCODERMIUM Shear, sp. nov.

PORONIA CHARDONIANA Toro, sp. nov.

Helotiaceae.

DASYSCYPHA DICRANOPTERIDIS Seaver & Whetzel, sp. nov.

Hysteriaceae.

OSTREIONELLA Seaver, gen. nov.

OSTREIONELLA FUSISPORA Seaver, sp. nov.

Stilbaceae.

ARTHROBOTRYUM PENICILLATUM (Lév.) Seaver & Chardon, comb. nov. [*Meliola ? penicillatum* Lév.].

PODOSPORIUM EFFUSUM Pat., sp. nov.

PODOSPORIUM PALLIDUM Pat., sp. nov.

Tuberculariaceae.

PUCCINIOPSIS CARICAE (Speg.) Seaver, comb. nov. [*Cercospora ? Caricae* Speg.].

Tremellaceae.

TREMELLA PALLIDA Overholts, sp. nov.

TREMELLA INDURATA Overholts, sp. nov.

Hydnaceae.

HYDNUM URSINUM Lloyd, sp. nov.

Boletaceae.

BOLETUS EARLEI (Murrill) Overholts, comb. nov. [*Gyroporus Earlei* Murrill].

Polyporaceae.

FOMES PORTORICENSIS Overholts, sp. nov.

POLYPORUS ACULEIFERA (Berk. & Curt.) Overholts, comb. nov. [*Trametes aculeifera* Berk. & Curt.].

POLYPORUS ARGILLACEUS (Murrill) Overholts, comb. nov. [*Ganoderma argillaceum* Murrill].

POLYPORUS BRITTONII (Murrill) Overholts, comb. nov. [*Amauroderma Brittonii* Murrill].

POLYPORUS FULVOCINEREUS (Murrill) Overholts, comb. nov. [*Coriolopsis fulvocinerea* Murrill].

POLYPORUS MAXIMUS (Mont.) Overholts, comb. nov. [*Irpex maximus* Mont.].

POLYPORUS NITIDUS (Murrill) Overholts, comb. nov. [*Ganoderma nitidum* Murrill].

POLYPORUS OCHROTINCTELLUS (Murrill) Overholts, comb. nov. [*Coriolus ochrotinctellus* Murrill].

POLYPORUS PALLIDOFULVELLUS (Murrill) Overholts, comb. nov. [*Coriolus pallidofulvellus* Murrill].

POLYPORUS PULVERULENTUS (Murrill) Overholts, comb. nov. [*Ganoderma pulverulentum* Murrill].

POLYPORUS SUBGLABRESCENS (Murrill) Overholts, comb. nov. [*Coriolopsis subglabrescens* Murrill].

POLYPORUS SUBINCRUSTATUS (Murrill) Overholts, comb. nov. [*Ganoderma subincrustatum* Murrill].

POLYPORUS TAYLORI (Murrill) Overholts, comb. nov. [*Coriolopsis Taylori* Murrill].

TRAMETES CIRRIFER (Berk. & Curt.) Overholts, comb. nov. [*Polyporus cirriferus* B. & C.].

Agaricaceae.

LENTINUS ECHINULATUS (Murrill) Overholts, comb. nov. [*Crinipellis echinulata* Murrill].

OMPHALIA EUSPEIREA (Berk. & Curt.) Overholts, comb. nov. [*Agaricus* (*Mycena*) *euspeireus* Berk. & Curt.].

Nidulariaceae.

CYATHUS COSTATUS Lloyd, sp. nov.

CYATHUS FIMICOLA Lloyd, sp. nov.

Lycoperdaceae.

LYCOGALOPSIS SUBICULOSUM Lloyd, sp. nov.

LYCOPERDON FIMICOLA Lloyd, sp. nov.

NOTES AND BRIEF ARTICLES

A Correction

In a recent paper pertaining to the morphological characters of some Sphaeropsidales, Archer[1] has described the development of the acervulus-like pycnidia of *Hendersonia Rubi* (West.) Sacc. and has discussed the relationship between this species and certain species of *Coryneum*. He has based this study on the development of the pycnidia in pure cultures and the study of the organisms on the host under natural conditions. Archer finds that in the young stages of perithecial development "the entire cavity is lined with fungous tissue and conidiophores, there being less tissue above than below but nearer the time of maturity there is found only a basal palisade-like layer of conidiophores arising from a rather thin layer of hyaline pseudoparenchyma. . . . In this condition the structure is recognized as a *Coryneum*. Quite frequently, even on the same cane, another type of fruit body is found which seemingly occurs where the cuticle or epidermis has become loosened and where there is no tension to be overcome by the hyphae which constitute the developing primordium. This structure, readily recognized as a pycnidium, tends to be globose, with definite pseudoparenchymatous tissue." Archer has also called attention to the complete agreement between the herbarium material and cultures of *Hendersonia Rubi* which he has had opportunity to examine and the original description of *Coryneum ruborum* Oud. together with the additional description and illustrations by myself.[2] Previously to the publication of my paper referred to, I had observed only the acervulus-like fruiting body as suggested by Archer, but after reading Archer's paper it has been my privilege to study a collection of *Hendersonia Rubi* collected by Archer in Michigan and the European collections in

[1] Archer, W. A. Morphological characters of some Sphaeropsidales in culture, with reference to classification. Ann. Myc. **24**: 1–84, *pl.* 1–8. *fig.* 1–8. 1926. (See pp. 46–51.)

[2] Zeller, S. M. *Coryneum ruborum* Oud. and its ascogenous stage. Mycologia **17**: 33–41, *pl.* 3. *text fig.* 1. 1925.

Sydow, Mycotheca germanica *1701* and *1702*. I now agree fully with Archer that the western collections upon which I had based my identification of *Coryneum ruborum* in Oregon are identical with the European *Hendersonia Rubi*.

Under these circumstances the ascospora stage described by the writer should be given Westendorp's specific name and the new combination should be **Ascospora Rubi** (Westend.) Zeller, comb. nov.

This thus identifies with the Pacific coast another typical European plant disease. In Europe this disease does considerable damage to plants of the genus *Rubus*. In England, according to Leaflet No. 269 of the Board of Agriculture and Fisheries, "*Hendersonia Rubi* Westendorp is responsible for most of the injury caused to raspberries and loganberries," where it is controlled by a spray of bordeaux mixture applied during the summer and by the usual sanitary methods. In Oregon I have applied the common name, **Ascospora cane spot**, for this disease.

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MYCOPHAGIC NOTES

THE YELLOW-GILLED RUSSULA

During the summer, when most species of *Russula* are fruiting, insects are so abundant and the plants so scattered that the mycophagist cannot depend very much upon them for his table. But I have found the yellow-gilled species very satisfactory, both in Virginia and northern Florida, for several reasons. It appears in the fall when the cool weather keeps the insects in check; it grows gregariously and appears abundantly in the open pine woods, coming up under the masses of needles, sometimes half a dozen or more together; and all parts of the hymenophore, including the tender, fleshy stem, are edible.

During the latter part of October, it was abundant about Lynchburg, Virginia, while at Gainesville, Florida, I collected it frequently toward the end of November and later for my table.

The species is a pretty one and readily recognized among the red species of the genus by its distinctly yellow gills. When very young they are white like those of *R. emetica*, but they very soon become yellow and there is no reason to confuse the two species.

In cooking the yellow-gilled *Russula*, I simply cut off the base of the stem; wash off adhering bits of dirt and trash; cut into halves or quarters according to size; and boil in a little water with salt for five or ten minutes until thoroughly soft. Evaporated milk and a dash of black pepper make excellent seasoning. Serve on buttered toast.

The autumn in Florida was quite dry and few fleshy fungi were found in November. On November 27, however, I collected enough for a mess by mixing *Pluteus cervinus*, *Lactaria Indigo*, *Laccaria laccata*, *Hygrophorus miniatus*, a species of *Helvella*, and the yellow-gilled *Russula*. On the following day, I found a quantity of the last species in a little pine grove and used it alone. The squirrels here are very fond of this species.

W. A. MURRILL

GAINESVILLE, FLORIDA,
November 29, 1926